THE AMERICAN GAS LIGHT JOURNAL

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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF EDITOR, WRINKLE DEPARTMENT,
MILWAUKEE, WIS., Oct. 25, 1905.

To the Members of the Western Gas Association: The next meeting of the Western Gas Association will in all probability be the last one, owing to the proposed merging of the three leading gas associations. Therefore, every effort should be made to make it a rousing success in all respects, and it falls to my lot as Editor of the Wrinkle Department to again appeal to you for this department. I earnestly request those who have made promises of contributions to remember such as soon as possible, and I fully expect to hear from quite a number who have not made any promises, but who I know are in possession of something that would prove of value to the Wrinkle Department.

Yours very truly, B. MCADAM, Editor.

[NOTICE.]

Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE WRINKLE DEPT.,
719 CITIZENS BUILDING,
CLEVELAND, O., June 13, 1905.

The Wrinkle Department of the Ohio Gas Light Association is now ready to receive contributions for the 1906 collection, and a sketch or description of all devices, formulæ and methods of accomplishing objects pertaining to the gas business, is respectfully solicited.

Please send a written explanation, accompanied by any sketch, photograph or drawing, to the above address, or a description alone will suffice.

Hoping to receive prompt compliance,

Yours very truly, W. E. STEINWEDELL, Editor.

BRIEFLY TOLD.

NOTES.—

MR. CLIFFORD E. PAIGE, formerly in the service of the Springfield (Mass.) Gas Light Company, and now superintendent of the plants of the Malden and Melrose (Mass.) Gas Light Company, declares that quite a sum will have to be expended on the works of the latter before the residents may expect a further reduction in the gas rate.

MR. J. R. DAWSON, of Springfield, Mass., who has been instrumental in the agitation for a gas supply in St. Johnsbury, Vt., a franchise for which purpose was recently granted him by the St. Johnsbury authorities, estimates that the plant will involve an expenditure of $65,000, and declares that the works will be erected next spring.

THE Bahia Gas and Electric Company was organized in Portland, Me., last month for the purpose of constructing, maintaining and operating gas and electric lighting plants in Bahia, Brazil, with a capital of $3,500,000. Its officers are: President, James S. Hernan, Portland; Treasurer, J. L. Brophy, same city.

"W. R. B.," writing from Chelsea, Mass., under date of November 26th incloses the following: "At a 'smoke talk' given by the Chelsea

LIBRARY OF

Board of Trade, in Odd Fellow's Hall, President James L. Richards of the Boston Consolidated Gas Company, spoke on 'The Relation of Public Service Corporation to the Municipality.' In the course of his remarks he stated that by July 1, 1906, and possibly before that date, the price of gas to all consumers taking the service of the Company, will be reduced 10 cents per 1,000 feet, making the price to Chelsea consumers $1 per 1,000 feet. Another announcement that pleased his hearers was that after December 1, of this year, the Company will make no charge for incandescent bulbs, and will replace all those burned out, without charge. Another part of Mr. Richards' address which awakened the lively interest of his hearers was an announcement that his Company is making good progress in experiments toward abolishing the nuisance of offensive odors from the gas and coke plant at Everett, and that the cessation of the trouble may be confidently expected within a reasonable time. Considering Chelsea's population said Mr. Richards, and the quantity of gas annually used by each customer, Chelsea is getting gas cheaper than most other cities where similar conditions prevail. Since 1901 the price of gas has been reduced twice, making the net price in Chelsea to-day $1.10. The question has been raised as to why Chelsea should not have 90-cent gas. Salem a city with about Chelsea's population, has an annual average per capita consumption of 18,250 cubic feet. The price there is $1.20. New Bedford has a consumption of 22,890, per capita, and there the price is the same as in Chelsea. Chelsea gives as a consumption an average of 18,497 feet per consumer. We have in Chelsea more than 600 customers, the income from whom to the Company does not pay for the cost of production and the care of their service. We feel that decreasing the cost of gas for manufacturing purposes will ultimately result in decreasing the cost to all consumers. This will be because of the consequent general increase in the consumption of gas. Regarding the cost of electricity in Chelsea, President Richards said that local consumers are paying but 16 cents per kilowatt hour, which is less than the cost in other cities, including Boston. He gave a very clear and interesting account of the processes by which the gas is manufactured at the Everett plant. He said that the consumers may rest assured that the present management will spare neither time nor expense in adjusting and rectifying causes for public complaint. Capt. W. E. McKay, Chief Engineer of the Everett plant, gave a description of the plant, and presented an interesting resume of his observations on the conduct of the gas business in Great Britain and on the Continent, comparing that with the conditions of the industry in this country. The speakers were introduced by Mr. James S. Harrower, the new President of the Chelsea Board of Trade."

"A. E. N.," writing under date of November 25th, informs us that the time for the next annual meeting of the Indiana Engineering Society has been put over to January 18, 19 and 20, instead of the time originally fixed upon. Numerous papers have been promised for the meeting, among them the following: "The Reclamation Work of the U. S. Geological Survey," by Mr. M. O Leighton; "Street Paving," by Mr. W. S. Moore, of Mishawaka, Ind.; "Concrete Masonry," by Mr J. Finan, Jr., Hamilton, O.; "A Water Supply and Electric Light Plant for Towns," by Prof. R. L. Sackett; "Some Experiences in Street Paving," by Mr. J. S Spiker, of Vincennes; "Some Architectural Features of Concrete Block Construction," by Mr. L. H. Gibson, of Indianapolis; "Soft Coal," by Mr. R. P. King, of Indianapolis; "Shop Management," by Mr. H. Diemer, of Indianapolis; "The Power Required to Operate Machine Tools," by Mr. R. C. Stevens, of Indianapolis,

ANOTHER interesting note respecting the last informal meeting of the engineers of Washington, D. C , shows that the meeting resulted in the formation of the Washington Society of Engineers. *Engineering News* in its report of the sessions says: "An informal meeting of civil, electrical, mechanical, mining, military and naval engineers was held in Washington, D. C., on the evening of November 23, and an organization was formed to be known as the Washington Society of Engineers. The meeting was attended by over 100 of the leading members of the profession in the city; a number of army and navy officers were present. The greater part of the evening was given over to the adoption of a constitution for the society and discussion of amendments thereto. Admiral C. W. Rae, U. S. N., acted as temporary chairman and D. W. Bliss, of the Bliss Electrical School, served as Secretary. The temporary committee designated to draft a constitution and make the call for the meeting consisted of Admiral C. W. Rae, Engineer-in-Chief, U. S. N., Chairman; Col. John Biddle, Engineer Commissioner of the District; H. M. Wilson, Civil Engineer; W. A. McFarland, Mechanical Engineer; C. W. Hayes, Mining Engineer; and L. D. Bliss, Electrical Engineer, Secretary. The election of officers will be held on the third Thursday in December.

[ABSTRACT—Continued from Page 836.]

PROCEEDINGS, THIRTY-THIRD ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

HELD IN THE HOTEL PFISTER, MILWAUKEE, WIS., OCTOBER 18–20, 1905.

FIRST DAY—MORNING SESSION.

The President—The next business will be the

REPORT OF COUNCIL ON NEW MEMBERS.

The Secretary recommending the following to membership:

APPLICATIONS FOR MEMBERSHIP.

Active.

Baer, H. S., Hancock, Mich.	MacDonald, G., New York City.
*Bains, G. D., Vicksburg, Miss.	*Malone, M. E., Denver, Col.
Baurhyte, W., Los Angeles, Cal.	Marks, R. J., Norfolk, Va.
Beal, A. R., Newburg, N. Y.	Martin, J., San Francisco, Cal.
Bean, L. H., Bellingham, Wash.	Murdock, S. T., LaFayette, Ind.
Bedle, W. E , South Amboy, N. J.	Murphy, W. J., Minneapolis, Minn.
Beggs, J. I., Racine, Wis.	Palmer, H. C., Buffalo, N. Y.
Boman, J. W., Hancock, Mich.	Parker, J. R., Hancock, Mich.
Boone, C., Astoria, L. I., N. Y.	Parsons, W. P., New York City.
*Bradley, C. W., Oak Park, Ills.	Perkins, J. H. Wilkes-Barre, Pa.
*Burt, A., Waterloo, Ia.	Pollock, A., San Francisco, Cal.
*Dewey, V. F., Detroit, Mich.	Pullen, J. T., Jackson, Miss.
*Dolley, G. M., Peru, Ind.	Ramsburg, C. J., Philadelphia, Pa.
*Dorner, W. F., Philadelphia, Pa.	*Rees, R., Memphis, Tenn.
Easton, F. W., Pawtucket, R. I.	Richards, W. A., Keyport, N. J.
Evans, G. B., St. Louis, Mo.	Rochat, H., Indianapolis, Ind.
Fisher, D. G., St. Louis, Mo.	De Sabio, E. J., Jr., San Francisco, Cal.
Forder, S. W., St. Louis, Mo.	
Godley, W., Philadelphia, Pa.	Shaeffer, J. W., Milwaukee, Wis.
Gore, J. M., Nevada, Mo.	Smith, A. E., Wausau, Wis.
*Goudy, W. R., Sioux City, Ia.	Smith, E. L., Towanda, Pa.
Hayden, H. D., Hazleton, Pa.	Soper, W. H., Halifax, N. S.
*Hofmann, L., Fort Wayne, Ind.	Spencer, E. L., New York City.
Howard, A. C., Philadelphia, Pa.	Starr, H. W., Schenectady, N. Y.
Hutchinson, W. E., Hutchinson, Kan.	*Stillson, H. G., Aurora, Ills.
	Stone, F. W., Ashtabula, O.
*Kimball, R. N., Kenosha, Wis.	*Strohn, R. N., Aurora, Ills.
Kraft, R. P., Milwaukee, Wis.	*Van Ness, L. G., St. Louis, Mo.
Lee, L. R., Martinsburgh, W. Va.	West, W. H., Altoona, Pa.
Lewis, W. M., Rockville, Conn.	Witherby, E. C., Syracuse, N. Y.
Lincoln, L. N., Mauch Chunk, Pa.	Zahm, A. W., Mason City, Ia.
*Lyons, B. F., St. Louis, Mo.	

Associate.

*Baldwin, C. K., New York City.	*Maxwell, J. P., Pittsburgh, Pa.
Best, F. W., Utica, N. Y.	*Morrell, C. P., Philadelphia, Pa.
Borst, E. E., Baltimore, Md.	Nutty, G. R., Pittsburgh, Pa.
*Brown, D. F., Albany, N. Y.	*Osborn, H. H., Chicago, Ills.
Corbus, F. G., Philadelphia, Pa.	*Printz, C. H., Fort Wayne, Ind.
Dean, M., New York City.	*Reeves, W., New Haven, Conn.
Ecker, H. G., New York City.	*Reynolds, M. G., Anderson, Ind.
*Fisher, T. J., Washington, D. C.	Riehn, E. L., St. Louis, Mo.
*Gildersleeve, D. H., N. Y. City.	*Schall, H. D., Chicago, Ills.
Hamlink, L. C., St. Louis, Mo.	Schuemann, T.H., Fort Wayne, Ind.
Henry, A. S., Chicago, Ills.	Stites, T., Gloucester City, N. J.
*Hyde, W. F., Milwaukee, Wis.	Stone, T. W., Fort Wayne, Ind.
Lapthorn, J., New Britain, Conn.	Weber, A. J., New York City.
Lea, Henry L., East Pittsburgh, Pa.	Westermaier, F. V., Philadelphia, Pa.
Litle, T. J., Jr., Gloucester City, N. J.	
Lemoine, L. R., Philadelphia, Pa.	Wheeler, A. G., Jr., N. Y. City.
*Lush, J., New York City.	

Junior.

Bullock, O. F., Fredericksburg, W. Va.	Gilbreath, E. W., Kansas City, Mo.
	Knapp, A. M., Ossining, N. Y.
Butler, W. H., Jr., Philadelphia, Pa.	Thomas, J. B., Jr., Philadelphia, Pa.
Cole, C. W., Kansas City, Mo.	Thorn, F. J., Jr., Philadelphia, Pa.
Genay, T. B., Philadelphia, Pa.	Way, A. D., Jr., Philadelphia, Pa.

Transfer Junior to Active.

Allison, W. A., Philadelphia, Pa.	North, F. S., Downingtown, Pa.
*Castor, W. A., Frankford, Pa.	Roberts, F. M., Mount Vernon, N. Y.

*Present at meeting.

ELECTION OF NEW MEMBERS.

On motion of Mr. C. J. R. Humphreys, Mr. Norris was instructed to cast the ballot of the Association in favor of the election to membership of the gentlemen named.

The President then called for the

REPORT OF THE COUNCIL,

which was read by the Secretary as follows:

To the American Gas Light Association—Gentlemen: Your Council has the honor to make its annual report as follows:

A separate report upon applications for membership recommends the election of 61 applicants for the active, 32 for the associate and 9 for the junior classes, respectively.

The resignations of 6 active and 7 associate members have been received.

The following papers have ben approved to be read at this meeting:

"Methods of Charging for Gas," by Alfred E. Forstall, New York.
"Improvements to Date in Consumers' Meters," by Chas. H. Dickey, Baltimore, Md.
"Taxation of Gas Companies," by George McLean, Dubuque, Ia.
"Condensation," by James S. McIlhenny, Washington, D. C.
"High Pressure Distribution to Date," by H. L. Rice, Aurora, Ills.
"Municipal Ownership," by B. F. Lyons, St. Louis, Mo.
Lecture—"Relativity of Economic Institutions," by Prof. B. H. Meyer, University of Wisconsin, Madison, Wis.

The following names were dropped from membership for non-payment of dues. [Names are given.]

The Council recommends to the Association that it pass a resolution providing that the Association will accept no entertainment at its meetings, except as is paid for by the sale of tickets, or as may be voluntarily provided by the members or residents in the city in which the meeting is held, or its immediate vicinity; and that no solicitation or assessment be made by the Council, or any committee thereof, for the purpose of entertaining the Association.

The Council recommends to the Association the appointment of a committee to report at the next meeting what progress has been made in the use of, and what steps should be taken in the judgment of such committee, to extend the use of the standard classifications of accounts as reported to the Association by the Committee on Uniform Accounts at a previous meeting.

The Council recommends that the report of the committee on amalgamation of the different gas associations be made the special order of business for 2:30 o'clock Wednesday afternoon, when the report of the committee will be presented to the Association.

The President—You have heard the report of the Council, gentlemen. What is your pleasure?

The report was accepted on motion of Mr. Forstall, the motion going that the various recommendations be taken in order.

Mr. A. E. Forstall moved that the first recommendation, in reference to the manner in which the entertainment provided by the Association at the annual meeting shall be paid for, be adopted. [Adopted.]

Mr. Forstall also moved that the recommendation of the President to appoint a committee of three to take the steps outlined in the recommendation be adopted. [Carried.]

The Secretary—The Council recommends that the report of the Committee on amalgamation of the different Gas Associations be made a special order of business for 2:30 o'clock Wednesday afternoon, when the report of the committee will be referred to the Association.

On motion of Mr. Norris the consideration of the report to the Association upon the question of amalgamation was ordered as special for 2:30 o'clock.

Reports of Secretary and Treasurer.

Secretary-Treasurer Ramsdell presented his annual reports, which, on motion of Mr. Paul Doty, were accepted.

Report of Trustees Gas Educational Fund.

The President called upon Mr. Forstall to read the report as follows:

To the American Gas Light Association and Subscribers: Gentlemen—The Trustees appointed at the Twenty-sixth Annual Meeting of the Association, held October 17th, 1898, to administer the Educational Fund formed by your subscriptions, submit the following report as to the work done from October 1st, 1904 to September 30th, 1905:

As will be seen by the Treasurer's report the amount of subscriptions has increased slightly since the last report but not as much as it was hoped would be the case. This is to be regretted because, although the subscriptions in force provide sufficient income to meet the current expenses with the number of members of the class kept down to the limit established by the rules and permit a small balance to be added to the surplus fund each year, this income is not sufficient to make it possible to increase the amount of work done. It is therefore to be hoped that more individuals and companies will join the ranks of the subscribers to both the current and the surplus funds. The latter especially should be built up to an amount that will provide an income that will not only carry on the present work but also make it possible for the Trustees to undertake research work that would be of benefit to the gas industry. To do this it would be necessary that the income be nearly twice as large as it is at present, a result that would be attained if only one-half of the gas companies in the United States and Canada that are not now subscribers made subscriptions bearing the same proportion to the amount of business done as is borne by those now in force.

The work of the Correspondence Class has been carried on throughout the year. The members of the Fifth Section having finished the 3 years' course, their connection with the class ceased on March 1st, 1905. The section of 1908 started work on January 2d, 1905, with a membership of 41.

The number of members in each section at the beginning of the year, and the changes that have taken place during the year, and the names of the members of the class who have completed the course during the year are shown in detail on the Secretary's report, which is appended.

The section of 1906 now contains 24 members, the section of 1907 29, and the section of 1908 49, making the total membership in the regular class 102. One special student is receiving the questions and answers with the section of 1907 and two special students are receiving the questions and answers with the section of 1908.

The card index of the principal articles published in the American Gas Light Journal, *Progressive Age* and the *Journal of Gas Lighting* has been kept up during the year. It is in constant use and is available and valuable for any subscribers wishing to look up particular subjects.

The surplus fund is made up of a contribution of $1,000, of subscriptions paid in in advance of the time when they are due, of unexpended balances and of interest received on investments. The proper portion of the advance subscriptions will, of course, be drawn out each year to meet expenses, but the unexpended balances and the interest will accumulate into a fund which will be available to assist in carrying on the work in case all the present subscriptions are not renewed when they expire. Respectfully submitted.

Trustees Gas Educational Fund.
Walton Clark, Chairman.
Alfred E. Forstall, Secretary.

Treasurer's Report for Year Ending Sept. 30, 1905.

Condition of Subscriptions.

		For Year 1904-1905.
Total of old subscriptions holding over from original 5-year period	$354.74	$143.58
Total new subscriptions reported Sept. 20th, 1904	21,386.00	4,277.20
Subscriptions received since that date	890.00	178.00
	$22,630.74	$4,598.78
Received from subscribers during year	$4,116.00	
Payments not applicable to year	247.00	
Total paid in by subscribers since Sept. 30, 1904, and available for year	$3,869.00	
Paid in previous to current year on account of 1904-1905 subscriptions	449.78	
Total paid in by subscribers available for this year	$4,318.78	
Still to be paid for this year	280.00	
Total subscriptions available for year		$4,598.78
Dues received for membership in special class		10.00
Sale of 6 sets of questions and answers for one year		30.00
Sale of Bookcase Units to American Gas Light Association		19.25
Total amount available for year		$4,658.03

Statement of Income and Expense.

Total amount available for year		$4,658.03
Expenses.		
Secretary's salary	$3,000.00	
Office rent	300.00	
Printing, stationery, postage, etc	649.25	
Binding periodicals	20.00	
Fire insurance on books	12.40	
Total expenses for year		3,981.65
Balance		$676.38

Cash Account.

Received from subscribers since Sept. 30, 1904, current fund	$4,116.00
Interest for 1 year on $2,000 Binghamton Gas Works first mortgage 5 per cent. bonds	100.00
Interest for 1 year on $1,500 Atchison, Topeka & Santa Fe R.R. general mortgage 4 per cent. bonds	60.00

Interest for 1 year on $1,000 Omaha Cas Company 1st mortgage 5 per cent. bonds	50.00	
Interest for 1 year on $1,500 New Gas Light Company, of Janesville, 1st mortgage 5 per cent. bonds (guaranteed by the United Gas Improvement Company)	75.00	
Interest on deposit in Knickerbocker Trust Company	52 55	
Sale of 6 sets of questions and answers for 1 year	30.00	
Dues received for membership in special class	10.00	
Sale of bookcase units to American Gas Light Association	19.25	
Total receipts for year	$4,512.80	
Cash balance from last year	197.40	
Total to account for		$4,710.20
Expenses for year paid	$3,981.65	
Expenses left unpaid from previous year	63.95	
Total paid out		$4,045.60
Balance		$664.60
Balance in Knickerbocker Trust Company, as per pass book, less checks unpaid	644.60	
Cash on hand	20.00	
		$664.60

Surplus Fund and Investment.

Amount paid in by subscribers in advance	$1,317.76
" " " " " to surplus fund	1,000.00
Unexpended balance from 1898-1899	1,330 99
" " " 1899-1900	397.70
" " " 1900-1901	343.71
" " " 1901-1902	211.88
" " " 1902-1903	359.89
" " " 1903-1904	396.88
Interest on bonds to date	1,092.22
" " deposit in Knickerbocker Trust Company	79.54
	$6,529.57

Already Invested.

$2,000 Binghamton Gas Works first mortgage 5 per cent. bonds	$1,930.00	
1,500 Atchison, Topeka & Santa Fe R. R. general mortgage 4 per cent. bonds	1,613.75	
1,000 Omaha Gas Co. first mortgage 5 per cent bonds	1,000,00	
1,500 New Gas Light Co. of Janesville first first mortgage 5 per cent. bonds (guaranteed by The United Gas Improvement Company)	1,500.00	
Furniture	147.60	
		6,091.30
Balance		$438.22

NEW YORK, October 12th, 1905.

We, the undersigned members of the Finance Committee of the Trustees Gas Educational Fund, have this day examined the books and accounts of William R. Beal, Treasurer, for the year ending September 30th, 1905, and have found the same to be correct, and the above balance of $644.60 to be in the bank. ALEX. C. HUMPHREYS,

Finance Committee.

Names of Students who Completed the Three Years' Course with the Fifth Section.

F. Austin, Frankfort, Ky.	H. T. Owens, New York City.
F. H. Beck, Aberdeen, S. D.	F. A. Rasch, Portland, Ore.
F. O. Cheney, Seneca Falls, N. Y.	H. Stillson, Milwaukee, Wis.
J. E. Colvin, Muncie, Ind.	H. Tieman, Covington, Ky.
W. E. Dodds, Pawtucket, R. I.	D. M. Walker, Lockport, N. Y.
D. E. Keppleman, Philadelphia, Pa.	C. W. Weston, Carbondale, Pa.

In addition to these, Boulton Earnshaw, Paterson, N. J., Robert Lindsay, New Bedford, Mass., and Bruno Zahn, Milwaukee, Wis., answered all except the last set of questions.

On motion of Mr. Walton Forstall the report was ordered accepted and to be printed in the minutes.

Mr. J. D. McIlhenny remarked that in connection with the report of the committee it would seem an excellent thing if the committee authorized the publication in one book of all the questions and answers to date. It would make a very practicable book.

Mr. W. R. Beal thought that as the Trustees of the Fund at a recent meeting discussed the subject thoroughly, and that the findings thereon were now in their hands, he thought they were competent to continue in charge of its custody.

Mr. McIlhenny withdrew his motion.

COMMITTEE ON PLACE OF NEXT MEETING.

The President appointed Messrs. Charles H. Dickey, Walton Clark and John Williamson a committee to name the next place of meeting.

The Vice-President, Mr. Charles F. Prichard, assumed the Chair, and President Cowdery read the

INAUGURAL ADDRESS.

[For the text of President Cowdery's address, see JOURNAL, Nov. 6, page 746.]

On motion, Messrs. W. A. Wood, A. P. Lathrop and Rollin Norris were appointed a committee to consider the address with instructions to report findings thereon at their convenience.

The President then introduced Mr. A. E. Forstall, of New York, who read a paper on

METHODS OF CHARGING FOR GAS.

[For the text of the Forstall paper, see JOURNAL, Nov. 6, page 749.]

Disscussion.

Mr. Frueauff—Mr. Forstall mentions the "maximum demand" charge as the principal difference between the methods advocated by him and those referred to in the Frueauff paper read last year, but the speaker thought it might be kept in mind that in addition to the so-called "maximum demand" other fixed expenses which should be considered were those capacity charges fixed largely by the general plan of taking on business, such as executive salaries, taxes, legal expenses, etc. He thought Mr. Forstall made a serious mistake in stating, "Since maximum demand-and-consumers' charges are not based upon actual costs, they are just as inequitable and therefore, in the long run, just as bad policy as a similar un-uniform charge per 1,000 feet." The consumer and capacity charges referred to follow the lines of cost, but it should be apparent that they must necessarily carry a profit because the company must still continue to sell to some consumers at a loss which loss must be made up from the profitable consumers. He could not see why it was necessary that such charges be based on actual cost while charges for gas used might show a profit. The company was

SECRETARY'S REPORT FOR YEAR ENDING SEPTEMBER 30TH, 1905.

	Fifth Section.	Section of 1906.	Section of 1907.	Section of 1908.	Special Class. 5th Sec.	6th Sec.	7th Sec.	8th Sec.	Total.
Members enrolled October 1, 1904	14	31	80	..	1	1	5	..	132
Entered class January 1, 1905	..	..	..	41	..	..	..	..	41
Additions to class since January 1, 1905	1	..	6	34	..	..	..	2	43
	15	31	86	75	1	1	5	2	216
Resigned during year	.. 1	3	5	..	..	..	..	9	
Dropped from class during year	3 6	54	21	..	1	4	..	89	
Finished course during year	12 ..	..	..	1	..	..	..	13	
	— 15	— 7	— 57	— 26	— 1	— 1	— 4	— ..	— 111
Total enrollment, September 30, 1905	..	24	29	49	..	..	1	2	105

Applications on file for admission to class January 1, 1906, 8.

legitimately entitled to a profit on all classes, wherefore there must be greater equity to the large user in paying these charges, based on cost, even though they carried with them a profit, than paying a uniform rate per 1,000 which must disregard cost when applied to his particular case. He declined to go over the items that Mr. Forstall thought were embraced under the demand, and called attention to the omission of the various fixed expenses at the works which did not increase or decrease as the sendout of gas increased or decreased, and the general expenses of the company largely based on the size of the company should be proportioned among the consumers according to their demand rather than to their consumption. Mr. Frueauff did not agree with Mr. Forstall that "such a course would not conform to the requirements that no greater profit be made off one consumer than that made off another when the same service was rendered to each." He (the speaker) knew of one company that had adopted a rate from an analysis of consumers who a year ago were supplied under straight meter rate and who this year were buying under the "readiness to serve" rate showed an increase of 40.2 per cent. in sales and an increase of 14 per cent. in income. In addition thereto much desirable business had been secured from new users that was found impossible to secure under the straight meter rates.

The President—We will be glad to hear from anyone else on this subject.

Mr. R. C. Dawes noted that Mr. Forstall had reminded them that the arguments against the equity of the traditional horizontal gas rates had not been controverted, and presented an alternative system of charges tacitly admitted by them all to be scientific and equitable, even though cumbersome. The Frueauff paper and the Forstall presentment left little to be said. They understood the proposed system, recognized its justice and realized the unevenness of the present system of charges. The inactivity to remedy the existing methods was hardly explainable save on the ground of littleness, or was it that they shrunk from a change of rates, which to maintain the old average would necessitate an increase of charges against 70 per cent and a decrease of charges against only 30 per cent. of customers? Going on, Mr. Dawes said: I suspect each of us feels something must be said in defense of a system entrenched behind a century of use. What I shall say is largely tentative, and has not even the merit of being the expression of a profound conviction. These strong arguments leave me in some doubt, but have we heretofore in our discussion of this question given sufficient weight to the possible demands of the public whom we serve? Most gas companies operate under franchises, which, of course, are contracts between the public and the company. Probably an essential consideration of these contracts is considered by the public to be the equality of charges, regardless of quantity purchased. Probably never before the last 4 years has it been presented to us so clearly, why it costs more to supply small consumers than large ones, and just how much more it costs; but it is wrong to assume men did not always know the general fact. Horizontal rates were never considered equitable and scientific in themselves, but the public has written them into our franchises. The use of the streets, according to their theory, is a privilege in the giving of which every citizen, whether he is likely to be a large or a small consumer, has shared, and having shared equally in giving each one has heretofore demanded that he should share in perfect equality of rates. If he were able to judge the temper of public feeling to-day they will continue to demand it. They are not likely to take kindly to the idea that a large consumer of gas should pay less per 1,000 feet than a small consumer. He was aware that under the proposed system the rate per 1,000 feet is the same to all, and that the adjustment is to be made by investment charges, readiness-to-serve charges, etc.; but this may possibly increase not quiet their resentment. To use Mr. Forstall's example, the fact that a customer using 1,000 feet of gas pays $5 per 1,000 feet, and one customer using 20,000 feet pays $1.75 per 1,000 feet, after all is said and done, may leave some part of the public irritable. It may be a fair rate and the profit may be the same to the company in each case, but if the public chooses to do so, it is also fair for it to give up the use of the streets upon the condition of equality of rates. Any change in gas rates which would appear upon analysis to be discriminatory against the small consumer, would, I fear, at this time particularly, be objectionable to the public. I say this without forgetting that our present rates are in a sense discriminatory against the large comsumer, but we are not responsible for it. We are under bond of tradition if not of contract, to make our rates uniform, and just now public feeling is not particularly sensitive about the large consumer. The small consumers outvote him and outtalk him. I do not wish to underrate the value the value of these suggestions by Mr. Frueauff and Mr. Forstall. Their arguments are beyond cavil; but we serve the public and we must be in harmony with them. If in the fullness of time an educated public opinion demands or even admits a scientific and equitable rate, then these men have established the basis of that rate, I fully believe; but it is my present opinion that the public inclines to prefer the horizontal rate, and for just the reason it has always preferred it—which is by the way the very reason the advocates of the new system condemn it—namely, because it discriminates in favor of the small consumer. I even think they always will prefer this sort of rate, and if they prefer it they will have it; for this question is not one to be solved by a legal analysis of the terms of a franchise, or by expert calculation of the cost of production, but is one which will eventually be decided from the viewpoint of the consumer. The consumer has been dealing with gas companies for decades. He has ideas in reference to them which may not easily be supplanted. These ideas lead with unwavering directness to the theory that there must be no discrimination in rates, based upon the quantity of consumption. Perhaps these ideas are wrong, but wrong ideas which have become deep rooted are not easily eradicated, even when they entail no personal hardship. When the inevitable result of the proposed change would be the imposition of an additional burden upon the large majority, for the apparent benefit of the small minority, the task becomes almost impossible. I am well aware that what I say is nothing new; but it is timely. The question of railroad rates is analogous, and the tendency of the discussion of railroad rates does not seem to be so much towards an inquiry into the comparative costs of wholesale and retail hauling as towards a defense of the proposition that the giving of privileges to the railroads justifies a public demand for absolute equality of rates. It will surely be the same when applied to gas rates.

Mr. H. L. Rice said his understanding of Mr. Forstall's argument was that he sought to make his maximum demand charge absolutely equal for all consumers. In obtaining that, he arranged certain demand charges amoug all consumers. Mr. Rice had in mind a town where over 50 per cent. of the entire consumption was delivered in 1 hour—from 11:30 A.M. to 12:30 P.M.—and perhaps 80 per cent. of the consumers took part therein; but the remaining 20 per cent. took no part in this general maximum demand, their highest demand being below the average. Following Mr. Forstall's classification, the 20 per cent., therefore, were not a tax on plant or street mains. The argument of equity to all would certainly not apply where consumers were made to share in such items.

Mr. Paul Doty asked Mr. Forstall, in making up his statement of profit, how he took care that there should be a profit on the average demand? As the speaker understood the Forstall argument, he made the maximum demand excess maximum demand, and provided for receiving a revenue upon excess maximum demand. Continuing, Mr. Doty said: I think in several cases later on he omits the word "excess." For instance, page 50, 3d paragraph from the bottom, we find: "Summing up the various charges as determined above, we have for the total maximum demand charge per year for a consumer with a demand of 80 cubic feet per hour." He leaves out the word excess there. I believe the argument is based on the excess for 80 feet. On page 51 he says: "If this charge varied in exact proportion in variation in the maximum demand, this would make a charge of about $6 for a maximum demand of 100 cubic feet per hour." Does that mean excess maximum demand? If it does not, the charge for 100 feet maximum actual demand per hour would mean a capitalization very much less than it is possible to deliver gas for and pay the investment charges. For example, if the hourly demand is 100 cubic feet, and that represents $\frac{1}{175}$ of the yearly demand, it would make the yearly consumption 160,000 cubic feet; an investment of $6 for an output of 160,000 cubic feet per year would make a capital charge of 37.5 cents; or 100 times 1,600.

Mr. Forstall did not see how a charge of $6 per year could make a capital charge of 37.5 cents.

Mr. Doty replied that 100 cubic feet per hour, multiplied by 1,600, the figure given as representing the yearly output, times the hourly demand equaled 160,000, and 160,000 into $6, a charge of $6 for maximum demand, would make a capital charge of $160,000, or 37.5 per 1,000. We know that we cannot invest capital on the basis of 37.5 cents per 1,000 cubic feet, and we further know that the figure is higher.

Mr. L. G. Van Ness said there were some apparent differences in opinion between last year's discussion and that of this year. In the paper read last year one could see that the calculation carried interest charges in the fixed charge to the customer, but in this year's calculation, the majority of the interest charges and profit was taken care of by the per 1,000 charge to the consumer. He would like to call attention to this matter of profit and interest. They had always allowed the

per 1,000 charge to take care of profit, but there was really very little difference between the profit or dividends on investment and interest charges. It was simply a difference as to the way in which a company was organized. If they had all stock and paid dividends on this stock, it appeared as a profit charge. If they had bonds and stock, the stock being of very little value, the interest on the bonds was the profit which replaced it. Therefore the speaker contended it was perfectly proper to have the profit on the gas carried by the per 1,000 rate, also the interest on the investment carried by the per 1,000 rate. Mr. Forstall went one step further in the calculation by allowing the interest on the investment for the equipment for the average supply of gas, and he allowed that charge to go into the fixed charge to consumers. He thought they could with equity allow all of the interest charges to be carried by the per 1,000 charged consumers. If they eliminated that from Mr. Forstall's figures, very little was left for the demand charge. On page 50 were one or two items purely of maintenance account. The rest of the items related to interest and depreciation, and he thought all would agree with him that they could consider depreciation in the same light as maintenance, wherefore, if they separated these into maintenance and interest, and transferred the interest charge to the per 1,000 rate, their fixed charge per consumer, or per 100 feet demand, would come still lower than Mr. Forstall had suggested. He thought Mr. Forstall was justified in transferring the interest on the average equipment to the per 1,000 charge, and he thought also they could go a step further, and in reducing these fixed charges to a very small amount they would find fewer of these consumers figuring as an actual loss to them than they had been led to believe by the previous calculations. He called attention to one other item which he thought was lost sight of. There was the promoter of business, and they all knew the promoter of business was irrepressible. If they fixed a charge on each consumer before rendering him a bill per 1,000 for the gas, the promoter would certainly absorb that "fixed charge" if it were going to prevent him getting the poorer classes of people to begin burning gas. If he "absorbed" they would charge it back to him in his department, and it appeared in the per 1,000 rate according to Mr. Forstall's classification. It was simply a transferring from one pocket to another. The largest percentage of fixed charges that could possibly be looked for in the gas business was 30 per cent. Now, if they recognized Mr. Forstall's step as being a proper one, the total fixed charge would be something less than 15 per cent. Then the question arose as to whether or not this fixed charge was large enough for them to take account of, considering the fact that they handicapped the promoter of new business if they were to adopt that rate universally. The speaker thought that the number of consumers who are a loss to the company depended entirely on the judgment of the man making the analysis as to how much of the expense should be considered a fixed charge, not proportional to output. It paid to study the situation carefully, so to make sure that they had nothing in demand charge that could be taken care of justifiably by the current charge per 1,000.

The Secretary read the following contribution to the discussion from Mr. Chas. D. Robinson, of Auburn, N. Y.: It seems the height of presumption for one of my limited experience to doubt the advisability of a measure that has had the active support of such men as those who have advocated this method of charging; but after considerable study of the subject there appears to me to be some strong arguments against its general adoption. There are two causes for reduction in price, namely, the desire to increase our output and public sentiment. Examining this method with the first cause in mind, and taking Mr. Frueauff's statement that the consumer's charge should be approximately $12, the maximum demand charge $15 per 100, with gas at 60 cents in a city where the average price is now $1.10, and that the system should be made optional, we find that under average conditions of consumption only such consumers as burn over 40,000 cubic feet annually would be benefited, hence adopt this rate. This would be 20 per cent. of the consumers of the average gas company. The remainder would still be paying $1.10 per 1,000. Assuming that within the next 10 years this company could reduce its price to $1 to all consumers, instead of which it gave the same amount of reduction to the 20 per cent. of its consumers, using over 40,000 cubic feet per year, and representing 50 per cent. of the company's annual output, this 20 per cent. would have an average rate of 90 cents, while 80 per cent. of the consumers were still paying $1.10. What does this average 90-cent rate amount to from a competitive standpoint? It is derived from the factors $12, $15 and .60. This is not low enough to compete with steam engines of over 40-horse power, or with crude oil for brazing, forging, etc., and gives a lower rate than is necessary to laundries, canning factories, etc., where the only available competitor is gasoline. It seems to leave out the ideas of the necessities of competition; that to compete with crude oil and steam power do not really need it, while three-fifths of those injured could ill afford the increase. One-third of our total consumers are wage earners, whose average rate would be about $1.80 per 1,000. If this rate should be made compulsory, you would actively antagonize 50 per cent. of your franchise givers. If you make it optional and give the contemplated reduction to your profitable consumers only, your published rate must remain high as compared with neighboring cities giving flat rate reductions, and 80 per cent. of your consumers will be antagonized; and if such a flat rate reduction should be compelled, a company would be in bad shape if 50 per cent. of its output was contracted for at less than the established rate. I have used Mr. Frueauff's figures instead of those given by Mr. Forstall, because his being a more extreme position my argument can be made plainer and stronger, but the argument advanced against his figures applies to those suggested by Mr. Forstall, but with less force, and as in some States the proposed rate would be illegal, the number affected would be so small that it would hardly pay to apply it. This rate can be of great use in determining at what price new business can be taken on at a profit. By its use it is easy to demonstrate that a 25-horse power gas engine, using 1,200,000 cubic feet per year at 50 cents per 1,000, is a more profitable consumer than a factory lighting load with a 2,500 cubic feet maximum hourly demand, using 600,000 cubic feet per year at $1.10 per 1,000. Its calling our attention to the fact that some of our business is unprofitable is a valuable feature, and by its nominal adoption at the option of the consumer this rate enables the manager to make special rates without being laid open to the charge of discrimination, as the amount of fixed charge is entirely in his hands; but I do not believe it will ever be good policy as a universal rate. My idea of a gas rate is a flat rate as low as the conditions of the business will warrant and public opinion demand, and special rates to special users, that a very low rate must and can be made, while in competition with gasoline such a low rate is not necessary, and the gas companies should have this profit to enable them to carry their less profitable business. I do not believe that a uniform Doherty rate on an optional basis will ever enable gas companies to make a rate that will meet competition in all fields that they can legitimately enter by special rates. A careful analysis of the books of the company with which I am connected shows that only one-third of the consumers would get this reduction, or 7 per cent. of the whole, need it. The remainder are those who use gas in business places when whatever it costs is part of the expense of conducting the business and is not felt as a hardship. In the matter of public sentiment I cannot see that this rate helps us in the least. In investigating this matter for a company that had decided that it must realize $1.15 on all gas sold, and expected to put in force a $1.35 rate, with special prices for special uses, I had our consumers divided into the following classes: Class (a), offices; (b), wage earners; (c) capitalists, professional men, etc.; (d), factories, places of business, etc. Using Mr. Frueauff's figures, compared with a $1.35 rate, I found as follows:

	Increase. Per Cent.	Unchanged. Per Cent.	Decrease. Per Cent.
Class (a)	5		
" (b)	30	5	17
" (c)	11	2	15
" (d)	4		11
	50	7	43

This table shows that if the Doherty rate could be universally applied, 43 per cent. of our consumers would be benefited at the expense of 50 per cent., and that more than half of those benefited will allow us to compete with other fuels whenever it can be done at a profit as shown by the Doherty system.

Mr. A. P. Lathrop thought that all who had made any analyses of their accounts, realized the fact that a large percentage of their customers not only brought no profit, but caused absolute loss. There was no question but that a rating system where each customer paid his maintenance cost would be ideal if it could be universally applied, for in that case they would either rid themselves of their present small customers, or else obtain a fair revenue from them, and they could be able to so lower the price of gas that they could encourage a class of business which at present prices they were unable to reach at all. He always felt that the system above mentioned required so much explanation and education that its universally attempted adoption would result in more harm than good, and he further thought that a system of rating based on quantity, with a minimum monthly charge which would prevent customers from demanding an installation they did not intend to use, would work much to their good in the end; but assuming that the

"readiness to serve" system, so called, could be applied, he thought Mr. Forstall put his costs too low. If a gas plant could be located wherever one wished to place it, and their customers would arrange their homes and places of business convenient thereto, they might get along with a system of 3-inch pipes, provided the sendout was absolutely uniform, but in consequence of having to locate plants in one section of the city and deliver the gas at very remote sections, it would hardly seem possible that a basis of a 3-inch pipe was a fair one to start from. With the exception of meters, Mr. Forstall assumed that 10 per cent. was sufficient to cover interest and depreciation which, assuming they were entitled to 6 per cent. on the investment, would only leave 4 per cent. for depreciation, which appeared altogether too small Mr. Forstall thought no profit should be made on the demand and customer's charge, but the speaker saw no reason why they should be compelled to make these heavy investments without expecting any return other than ordinary interest. It frequently happened that much of this investment was out of use for long periods of time. An objection to this system of rates was that it is based on the idea that all customers must contract to use your product for 1 year. With the larger companies particularly there is an immense floating population which moved many times during the year, and the costs ought to be increased proportionately to take care of that class of business. Mr. Forstall's plan of charging 25 cents per month fixed charge would help out very materially, but he could not see that it did anything towards encouraging business they ought to have. He thought the question of proper charges was one to which the gas companies had given altogether too little attention, and was one which in the near future would have to be considered very carefully.

Some Routine Business.

The President noted that as the hour for adjournment had passed it would seem good policy to not cut off the discussion but to carry it over from adjournment.

Mr. E. G. Pratt then addressed some remarks to the convention regarding the registration of the members. He referred to the fact that a list of the new members had been put upon a placard and requested the members to procure their tickets for the various entertainments, so that the arrangements made by the committee might proceed smoothly.

The Secretary called the attention of the members to the necessity of depositing their railroad certificates early so that the agent of the railroad could vise them.

The meeting then adjourned until 2:30 o'clock.

ROLL CALL.

The following members were in attendance:

Active.

Africa, W. G., Manchester, N. H.
Allen, W. H., Newark, N. J.
Anderson, W. C., Plymouth, Pa.
Baehr, W. A., St. Louis, Mo.
Barret, A. H., Louisville, Ky.
Beadenkopf, G., Baltimore, Md.
Beal, T. R., Poughkeepsie, N. Y.
Beal, W. R., New York, N. Y.
Bennet, C. W., Red Bank, N. J.
Blinks, W. M., Kalamazoo, Mich.
Bredel, F., Milwaukee, Wis.
Brown, E. C., New York, N. Y.
Brown, R. B., Milwaukee, Wis.
Brown, R. E., Mankato, Minn.
Buck, H. M., Waukesha, Wis.
Bunker, T., Newark, N. J.
Butterworth, I., Grand Rapids, Mich.
Cathels, E., Providence, R. I.
Clabaugh, G. W., Omaha, Neb.
Clark, J. A., Jr., E. Orange, N. J.
Clark, J. C. D., St. Louis, Mo.
Clark, W., Philapelphia, Pa.
Clarke, G. S., Kansas City, Mo.
Clary, E. D., Burlington, Ia.
Coggshall, H. F., Fitchburg, Mass.
Collins, D. J., Philadelphia, Pa.
Combs, R. B., Philadelphia, Pa.
Cooper, W. H., Amsterdam, N. Y.
Cosgrove, W. L., Atlanta, Ga.
Cowdery, E. G., St. Louis, Mo.
Cresson, B. F., Easton, Pa.
Cunningham, J. H., Westminster, Md.
Curran, G. W., Philadelphia, Pa.
Curtis, S. P., Philadelphia, Pa.
Dashiell, P. T., Newark, N. J.
Davies, H. W., Keyport, N. J.
Dawson, G. H., La Grange, Ills.
Dell, J., St. Louis, Mo.
Diall, M. N., Terre Haute, Ind.
Dickey, C. H., Baltimore, Md.
Doherty, H. L, New York, N. Y.
Doty, P., St. Paul, Minn.
Dunbar, C. H., Houston, Tex.
Dunbar, J. W., New Albany, Ind.
Dutton, L. R., Wyncote, Pa.
Earnshaw, E. H., Philadelphia, Pa.
Ellis, J. W., Providence, R. I.
Eustace, J. H., Chicago, Ills.
Eysenbach, E. E., Binghamton, N. Y.
Ferguson, B. B., Portsmouth, Va.
Forbes, C., London, Ontario, Can.
Forbes, J., Chattanooga, Tenn.
Forstall, A. E., New York City.
Forstall, W., Philadelphia, Pa.
Frost, W. H., Delray, Mich.
Frueauff, F. W., Denver, Col.
Ganser, H. H., Norristown, Pa.
Gartley, W. H., Philadelphia, Pa.
Glasgow, A. G., London, Eng.
Glass, S. J., New York, N. Y.
Golden, J. W., Savannah, Ga.
Goodnow, G. F., Waukegan, Ill.
Gould, V. K., Bangor, Me.
Graf, C. H., Indianapolis, Ind.
Graves, H. C., Dayton, O.
Guffey, J. F., Pittsburg, Pa.
Guidin, O. N., Fort Wayne, Ind.
Haase, E., Milwaukee, Wis.
Harper, G. H., Altoona, Pa.
Hart, W. F., Washington, D. C.
Horton, T. O., Stapleton, N. Y.
Humphreys, C. J. R., N. Y. City.
Humphreys, J. J., Jr., Brooklyn, N. Y.
Hurlburt, A., Philadelphia, Pa.
Hyde, H. H., Racine, Wis.
Jelliffe, C. N., New York, N. Y.
Johnston, M. E., Newark, N. J.
Jourdan, J. H., Brooklyn, N. Y.
Kellogg, L. L., Sioux City, Ia.
Keppelman, J. H., Reading, Pa.
Klumpp, J. B., Philadelphia, Pa.
Knowles, W. P., Richmond, Va.
Lane, F. K., Altoona, Pa.
Lathrop, A. P, Detroit, Mich.
Linstedt, J., Manitowoc, Wis.,
Linton, S. E., Jr., Savannah, Ga.
Loichot, J. L., Canton, O.
McDonald, D., Louisville, Ky.
McDonald, W., Albany, N. Y.
McGregor, W., Pawtucket, R. I,
McIlhenny, J. S., Washington, D.C.
McIlhenny, J.D., Philadelphia, Pa.
McKenzie, W.H, Sioux Falls, S.D.
McLean, G., Dubuque, Ia.
MacMillan, G., La Crosse, Wis.
Mann, H. E., Cleveland, O.
Mansur, J. H, Royersford, Pa.
Merritt, A.H., Niagara Falls, N. Y.
Merritt, W. H., Lebanon, Pa.
Middleton, R. L., Washington, D.C.
Miller, T. D., New Orleans, La.
Molony, M., Philadelphia, Pa.
Moore, N., Kansas City, Kan.
Morrell, E. E., Oak Park, Ills.
Morton, F. N., Philadelphia, Pa.
Morton, H. E., Boone, Ia.
Moses, F. D., Trenton, N. J.
Nettleton, C. H., Derby, Conn.
Norris, R., Philadelphia, Pa.
Nute, J. E., Fall River, Mass.
Nutting, C. H., Chicopee, Mass.
Palmer, E. H., Geneva, N. Y.
Palmer, L. T., Tonawanda, N. Y.
Parker, F. H., Burlington, Vt.
Parker, R. M., Buffalo, N. Y.
Pease, A. C., Lowell, Mass.
Pettes, W. H., Newark, N. J.
Polk, R. W., St. Louis, Mo.
Pond, E. C., Petersburg, Va.
Pratt, E. G., Milwaukee, Wis.
Prichard, C. F., Lynn, Mass.
Purcell, T. V., Chicago, Ills.
Putnam, W. R., Red Wing, Minn.
Quackenbush, C. H., Ardmore, Pa.
Quinn, A. K., Newport, R. I.
Ramsdell, G. G., New York City.
Ramsey, W. H. C., Johnstown, Pa.
Rice, H. L., Aurora, Ills.
Richardson, F. S., North Adams, Mass.
Riselay, W. S., Buffalo, N. Y.
Roohan, P. F., Saratoga Springs, N. Y.
Roper, G. D., Rockford, Ills.
Russell, D. R., St. Louis, Mo.
Sargent, F. H., Lawrence, Mass.
Schmidt, F. W., Jersey City, N. J.
Searle, R. M., Mount Vernon, N. Y.
Shattuck, J. D., Chester, Pa.
Shelton, F. H., Philadelphia, Pa.
Smart, F. R., Jr., York, Pa.
Smith, W. H., Philadelphia, Pa.
Snow, W. H., Holyoke, Mass.
Spangenberg, B. H., Philadelphia, Pa.
Spinning, W. V., Peru, Ind.
Spragle, L. D., Johnstown, N. Y.
Stratton, F. A., Mount Vernon, N. Y.
Summey, D. L., Waterbury, Conn.
Talbott, F., Danville, Va.
Taylor, J. D., Jr., Richmond, Ind.
Tobey, F., Jr., Kingston, N. Y.
Tompkins, J. P., Atlantic City, N. J.
Travis, F. M., Torrington, Conn.
Tyler, W. G. Philadelphia, Pa.
Vincent, G. I., Philadelphia, Pa.
Von Maur, J. D., St. Louis, Mo.
Walker, M. T., Fort Madison, Ia.
Wallace, R. A., N. Hamilton, Ont.
Walters, B. S., Blue Island, Ill.
Waring, G. H., Omaha, Neb.
Warmington, D. R., Cleveland, O.
White, C. E., Wakefield, Mass.
White, E. C., San Antonio, Tex.
Williams, L. S., Harrisburg, Pa.
Williamson, J., Chicago, Ills.
Wilson, W. A., Portage, Wis.
Witherby, E. E., New York, N. Y.
Wood, W. A., Boston, Mass.
Wortendyke, I. F., Janesville, Wis.
Young, A. W., Knoxville, Tenn.
Young, J., Allegheny, Pa.
Young, P., Pittsburgh, Pa.
Young, R. R., Passaic, N. J.
Young, R., Pittsburgh, Pa.

Associate.

Aikin, H. C., Chester, Pa.
Azoy, A. C. M., New York City.
Barrows, G. S., Gloucester City, N. J.
Brownell, E. E., Dayton, O.
Carpenter, H. A., Pittsburgh, Pa.
Cartright, H. R., Philadelphia, Pa.
Collins, W., Stamford, Conn.
Crane, W. M., New York City.
Cressler, G. H., Fort Wayne, Ind.
Cruse, A. R., Philadelphia, Pa.
DeHart, J. S., Jr., Newark, N. J.
Dickey, E. S., Baltimore, Md.
Dods, J. C., St. Louis, Mo.
Eaton, A. B., Chicago, Ills.
Fiske, J. T., Port Chester, N. Y.
Fowler, J. S., Philadelphia, Pa.
Garrison, J. J., Detroit, Mich.
Graves, G. W., Albany, N. Y.
Gregg, F. M., Cleveland, O.
Harper, H. D., Chicago, Ill.
Hayward, S. F., New York, N. Y.
Johnston, E. D., Connersville, Ind.
Kahn, L., Hamilton, O.
Kellum, B. J., Chicago, Ill.
McDonald, A., Erie, Pa.
McDonald, D., Albany, N. Y.
Mallory, A. S., New York, N. Y.
Mills, B., Port Chester, N. Y.
Mordue, T. N., Chicago, Ills.
Mueller, R., Decatur, Ills.
Myers, J. B., Philadelphia, Pa.
Nichols, C. B., Philadelphia, Pa.
Norton, H. A., Boston, Mass.
Osius, G., Detroit, Mich.
Parker, G. W., New York City.
Persons, F. R., Toledo, O.
Plantinga, P., Cleveland, O.
Prendergast, D. J., N. Y. City.
Rancke, L. N., Baltimore, Md.
Rodgers, E. H., Philadelphia, Pa.
Rutter, T. V., New York City.
Schutt, H. L., Buffalo, N. Y.
Steinwedell, W. E., Cleveland, O.
Stratton, S. S., Chicago, Ills.
Taplin, F. E., Cleveland, O.
Thomas, R. H., Philadelphia, Pa.
Van Wie, E. G., Detroit, Mich.
Wells, F. K., New York City.
Wickham, L., St. Louis, Mo.
Witherden, G. M., Philadelphia, Pa.

Junior.

Calkins, W. B., St. Louis, Mo.
Schiller, C. C., Baltimore, Md.

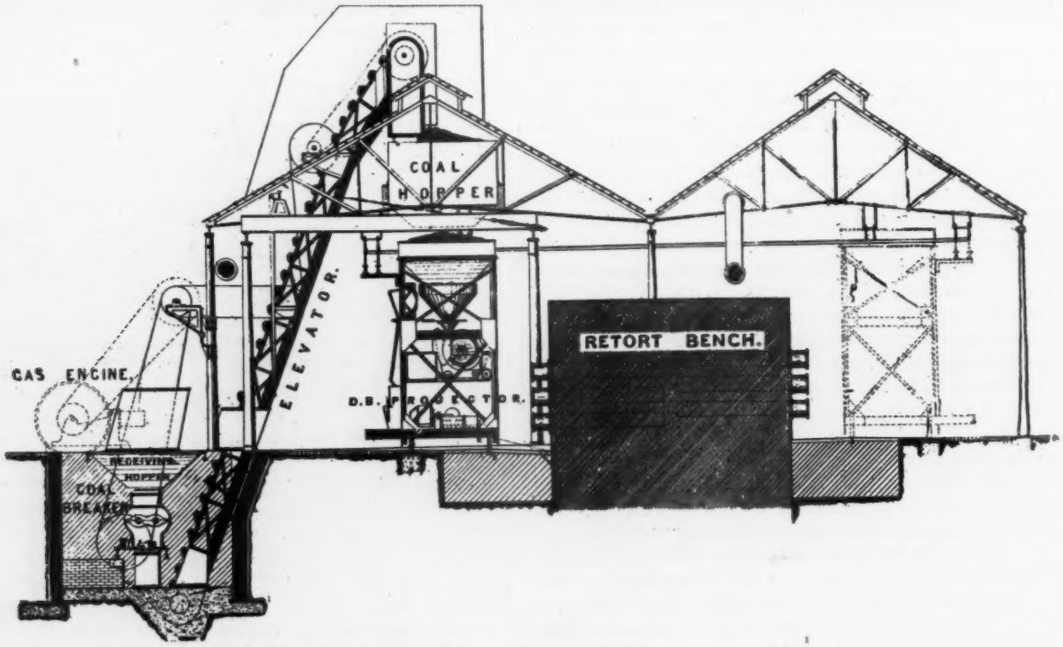
(To be Continued.)

Coal Handling Plant and "D. B." Projector at Alloa.[1]

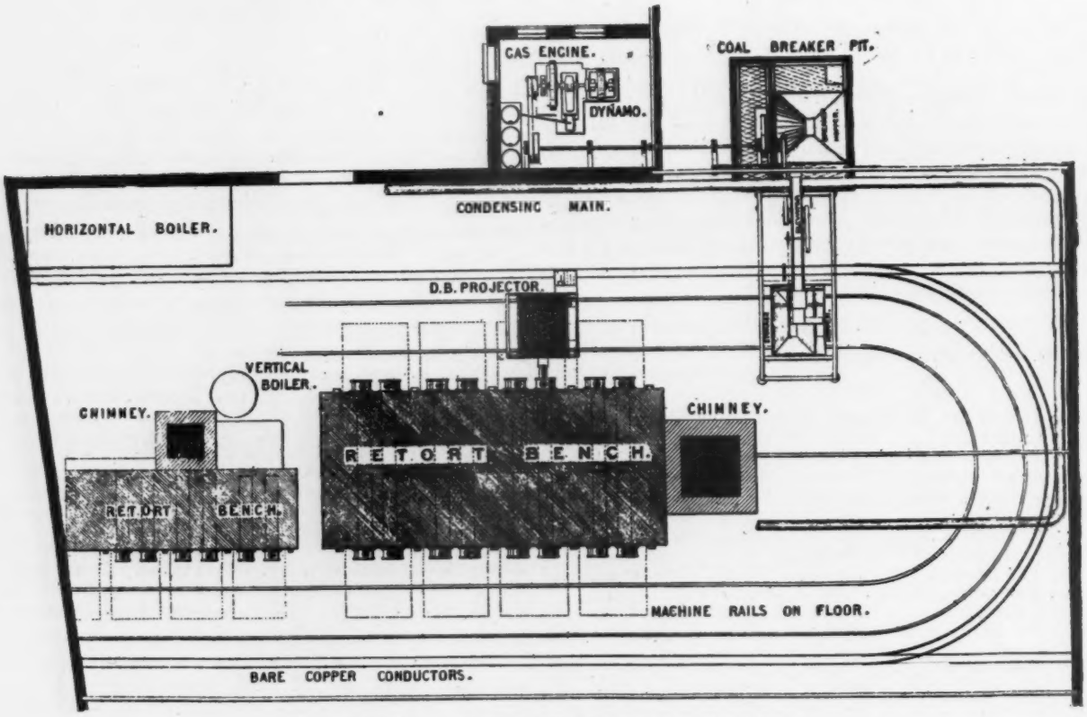
An installation of coal handling plant, with a De Brouwer projector, has been introduced at the Alloa Corporation gas works. So far, it is the first adoption of this particular plant in Scotland; and the following particulars in conjunction with the illustrations, will therefore doubtless be of interest.

The quantity of coal carbonized at Alloa last year was 11,600 tons, from which 103,000,000 cubic feet of gas were manufactured. The

1. *Journal of Gas Lighting.*



Cross Section of the Alloa Retort House, with Coal-handling Plant and "D.B." Projector.

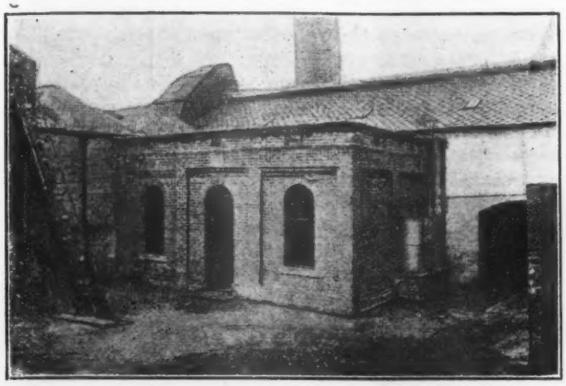


Plan of Retort House, with Coal-handling Plant and "D.B." Projector.

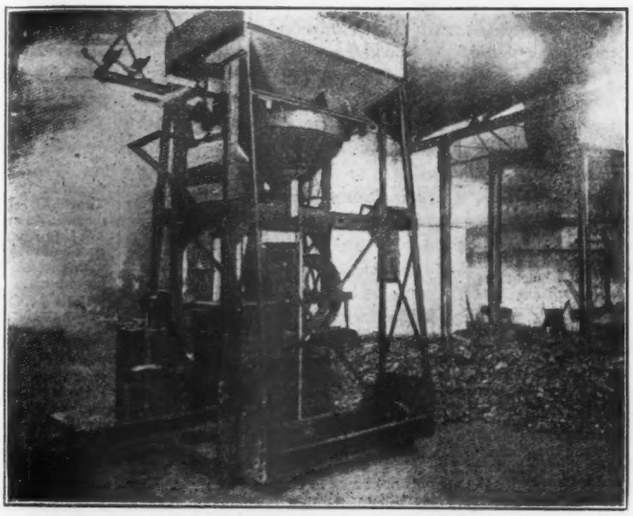
retort house contains 8 beds of 8 retorts, each 9 feet 3 inches long, and 3 beds of 6, all set back to back. The coal store is under the same roof. The retorts not being "throughs" necessitated the arrangement of the installation so as to permit of the one projector being worked from both sides of the retort house; and this has been accomplished by simply carrying the rails on which the charging machine travels around a curve at the west end. This is a unique feature of the installation; the plant being arranged to suit the retort bench as originally designed. Any future extension of the bench will be carried out by dismantling the old one, with ovens of sixes, at the opposite end of the house. The introduction of the plant has not required any structural alterations in the retort house. The charging machine with the overhead hopper, was made of less than the customary height, because of the somewhat low roof, to permit the machine passing round the end of the retort bench.

Electricity is the motive power for working and propelling the machine; the coal breaker and elevator being belt-driven. A new engine house has been erected contiguous to the retort house, and contains a 25½ brake horse power "National" gas engine, of the high speed electric lighting type, with a dynamo developing 9 kilowatts at 220 volts continuous current (supplied by the British Electric Plant Company, Limited, of Alloa) coupled direct by means of a "Zodel" flexible coupling. There is sufficient space left in the engine house for another set of generating plant being put down in view of coke discharging and handling plant being introduced at some future time. A 6-inch belt is provided for driving from the pulley on the engine crank shaft to a pair of fast and loose pulleys on the line shaft carried on brackets on the engine house wall. The belt striking gear for starting and stopping the coal breaker and elevator is operated from the inside of the retort house.

The pit in which the coal breaker and hopper was placed was constructed of concrete. Considerable trouble was experienced here with



The Engine House and Retort House Exterior, with Coal Elevator on Roof.



The "D. B." Projector at Alloa.

water; the depth of the excavation being 16 feet from the retort house floor, and about 8 feet beneath the low water level of the Forth, which passes quite close to the works. The hopper over the coal breaker is fixed level with the retort house floor, the carts tipping in the coal direct. It should be mentioned that at present there is no railway siding into the works. A bye-pass shoot is provided for directing nuts to the elevator boot without passing through the breaker, which is of powerful 4-claw type to break large lumps of coal, and is capable of adjustment by means of a regulating arrangement opening or closing the claws, and so breaking the coal to any desired size. The bucket elevator delivers coal into an overhead storage hopper of 12 tons capacity, with slide doors worked by hand levers from the retort house floor, for feeding coal into the hopper on the charging machine.

The projector is fixed in a framework mounted on wheels, and travels in front of the retort bench on rails fixed in the floor. The projector can be raised, lowered and adjusted to the heights of the various tiers of retorts, by means of chains passing round the drum working in a cast iron frame at the base of the machine, and driven from gearing from a 7-horse power electric motor, which also drives the propelling gear; and a clutch is arranged so that the machine can be propelled, or the projector hoisted or lowered, by a single movement of the lever. The motor is fitted with a reversing arrangement by which the direction of the hoisting or travelling can be changed. The large grooved pulley is 39 inches in diameter and 14 inches in width on the face; the groove being 8 inches wide by 4½ inches deep. The belt is of rubber, and is made slightly thicker in the center, where the coals come in contact with it; experience elsewhere having proved the superior virtue in wearing qualities of rubber as compared with leather. The motor on the projector is of 3½ brake horse power. The hopper fixed on the machine is of 2½ tons capacity.

The experience in working the projector has been very satisfactory. With 8 hour shifts, one man per shift does all the charging of the retorts and the handling of coal into the hoppers; the other men merely drawing the retorts, cleaning the producers, etc. The men have taken kindly to the machine, and have been ready to perceive its advantages. What is specially striking about it is the extreme ease with which it can be manipulated, and the aptitude of the ordinary stoker in learning its working. That it is capable of performing the work of charging retorts in a perfectly satisfactory way, with even layers of coal, there is not the least doubt. It has been found quite an easy matter to put in a heavy, a medium, or a light charge of coal as desired, according to the condition of the retorts. To charge a 9 foot retort takes about 14 seconds. The plant has been in operation only a few weeks and as yet it is too soon to speak of resulting economy in wages and other undoubted advantages; but compared with hand stoking, as formerly, only about half the number of men are required.

Notes on the Induction Motor as a Generator.

[A paper read by Mr. T. P. E. Butt, at the last meeting of the South African Association of Engineers.]

It has been known almost from the initial invention of the asynchronous alternating motor, generally known as induction motor, that, if connected to its supply mains and driven at a slightly higher speed than synchronism, it reverses its usual function and becomes a generator. There is another point in such machines equally interesting, and perhaps more useful, demonstrated by Danielson about 2 years ago. He described a method of converting an alternating current motor from asynchronous to synchronous by suitably exciting the rotor with continuous current. This is a point for which much use should be found, for such machines, in addition to possessing the inherent qualities of the synchronous motor, are self starting. In order to effect this the motor is started up as an induction motor on light load, so that its speed approximates synchronism. At the right moment the motor is switched over from the resistance to a suitable source of continuous current, which pulls it into synchronism and maintains it at this speed. Such machines should be of use on inductive systems to raise the power factor, where such an inflexible arrangement as the ordinary synchronous motor may not find favor. Circumstances having placed the writer in a position to test the above principle, he assumed that the converse would hold good; that is, if power were applied to the rotor shaft, and its windings supplied with continuous current, the outcome would be a successful generator. The results are given in this paper, and, although not obtained under favorable conditions, are of interest.

About 2 years ago, when it was decided to augment the lighting supply of Johannesburg from the electrical plant of the Robinson Deep G. M. Company, it was found necessary to obtain an additional generator to provide a reserve for the existing plant, in case of accidents and to allow for general repairs. The management did not at first agree with this idea and the project temporarily fell through. It happened, however, that a 300-horse power 2,000-volt induction motor, originally intended for operating a hoist, had been lying dismantled on the property for several years, and the suggestion of the writer to convert this into a generator was entertained and adopted.

It should be explained here that the generator plant consisted of two direct coupled 3-phase 250-kw. machines working at 2,100 volts, 60 cycles, and the power demand was such as to require one generator constantly running, the second assisting on the peak of the load for several hours during the day, whilst from 4:30 P.M. till midnight this second generator was loaded and often overloaded for the municipal supply, and although in case of accident to either generator the mine requirements would have had first consideration, the town supply was sufficiently remunerative to warrant the installation of another machine. Owing to the difficulty in getting an engine suitable for driving machine at short notice, it was arranged to operate it from one of the mill engines, a 500-horse power single crank, compound engine, having at that time a surplus of about 300-horse power. A friction clutch and pulley were attached to an extension of the line shafting, and rope drive provided. This necessitated the location of the generator in a wing at the extreme end of the power house, in a position invisible from the main switchboard.

To use the generator asynchronously involved very little alteration in the existing apparatus. The windings, of course, remained the same, but it was necessary to make provision for a variable speed for this machine, which, unlike the ordinary generator, requires a slight increase of speed to take an increased load. To get a variable speed from the mill engine was out of the question, and recourse had to be made to other means, viz., magnetic slip; this demanded the installation of the huge rheostat which originally formed the controller. This method would not be an efficient one if constantly used, but this was not in-

tended, its use being restricted, as a rule, to the short period of time required in putting in, or taking out of parallel with another generator, to regulate the transfer of load. This arrangement demanded a permanent increase of speed above that of synchronism, and an increase of 5 per cent. was allowed, which was as much as possible, taking independent working into account. The controller was located near the generator and operated by motor from the switchboard, the position of its axle being indicated by luminous signals.

The arrangements for asynchronous running were practically complete, but for independent working an exciter was required, suited to the rotor winding, and for this purpose a disused plating dynamo was found, having a capacity of 900 amperes at 30 volts. A low tension panel was installed near the generator, and the rotor windings connected to it, provision being made for rapidly connecting them to either the exciter or controlling rheostat.

The frequency of the asynchronous generator is determined solely by the currents supplied to it by the synchronous machine regardless of its own speed. The speed, however, must not rise above a certain critical value, or the power required from the prime mover will fall off rapidly, due to magnetic leakage, as in the case of the motor. Provision then must be made for this in governing the engine, for should this point be exceeded the engine might run away. The power factor will be dependent on the amount of load supplied to the system, but independent of the nature of such load, so that any currents demanded by apparatus employed on the system not in phase with the working current must be supplied by the synchronous machine. Paralleling is, of course, a simple matter, there being no need for synchronizing; it is always better, though, to get the speeds as near as possible to avoid disturbance to the system if the machine is of large relative capacity.

When the machine is connected up to operate as a synchronous generator, the rotor is simply transformed into a field magnet with a continuous iron surface, instead of the usual definite polar projections.

The first trial took place under asynchronous conditions; the machine, it should be stated, had a distributed winding, three slots per phase per pole in stator and four in rotor, the the number of poles being 24, so that the permanent speed was 315 revolutions, or 5 per cent. above synchronism at 60 cycles. At this speed, or near it, and with the rotor resistance all in circuit, the switch was closed on the bus bars, thus paralleling it with a synchronous generator which at the time was delivering 90 kw. A current equivalent to 30 per cent. of the non-inductive full-load current was taken, and under these conditions the disk movement of a sensitive watt-hour meter in circuit was scarcely perceptible; the resistance was then cut out, until the whole load was taken, and steam was then shut off the synchronous machine, which continued running as a motor. After this steam was again admitted and the load increased and distributed by means of the rheostat on the two machines until a combined load of 362 kw. was carried, out of which the induction machine supplied 170 kw.

This was the limit attained and was determined by the speed of the mill engine, which was not well governed and this point became unstable, thus causing sudden transfers of load between the generators and big voltage variations. A higher limit would have been obtained with a more favorable load—that is, motors of relatively small capacity or lights—but nothing less than 50-horse power motors were available, and the switching on of such at this stage would cause a marked fall in speed of the mill engine, upon which heavy surgings of current would take place, knocking the voltage beyond control and dislocating the service.

The machine was next tried as an independent generator. More interest was attached to this test, as if the operation proved successful, this method of working would have considerable commercial value. Two methods of exciting the rotor were available, either by cutting out one branch of the winding altogether, and connecting the other two in series to form the path for the current, or by connecting two branches in parallel and putting the combination in series with the third. This latter method was found to be more economical in exciting current. The trials under these conditions and with an induction motor load resulted in attaining an output of 180 kw. before the engine governing gave trouble. The excitation at this load was 7 kw. On a lighting load the results were extremely satisfactory, the output limit being largely increased; in fact, on certain occasions of big demand at the municipal lighting station, loads up to 315 kw. have been delivered with an excitation of 330 amperes at 25.5 volts. The engine under this load had got beyond governor control and fallen 4 per cent. in speed, but beyond this showed no signs of distress. This load, however, was abnormal, the maximum seldom exceeding 260 kw. The excitation required at no load was 138 amperes at 9.5 volts or 1,311 watts as against 27 amperes at 133 volts (3,591 watts) for the regular generator. At loads of 180 kw. on similar power factors of approximately 0.75, the excitations were 6.4 and 5.2 kw. respectively; here the longer air gap of the regular generator tells to advantage. On similar loads (lighting) of 220 kw. the order is reversed, the regular generator requiring 5.2 kw. against 4.5 kw. of the converted machine.

The excellent results obtainable on non-inductive loads, neglecting the part due to less armature reaction, were attributable to the gradual consumption of the load, under lighting conditions, as distinguished from the sudden changes caused by switching on motors of large relative capacity, when on inductive loads. The temporary pulling up of the prime mover under the latter conditions, was, of course, noticeable on lighting loads when heavy banks of lamps were thrown on; but this occurred very seldom; and it is obvious that, although inconvenient in such cases, it has not the dangerous factor which such occurences might mean to motor loads. This machine offers another field of usefulness as a motor, and with its present connections can be used in case of emergency to drive half the mill (100 stamp), no change at all being necessary beyond disconnecting the mill engines.

Independent working was certainly a success, and up to the time of the writer leaving the company it was nearly always used as such. The short air gap and low flux density in the rotor, although favorable as a motor, allowed a big armature reaction when generating on inductive loads, but the effects of this would not have been so noticeable with automatic voltage regulation, such as, say, the Tirrell system. As to the use of such machines in mining districts, such as the Witwatersrand, it depends entirely on circumstances. No doubt in the near future isolated electric generating plants will disappear and be replaced by central supply stations, operating over suitable areas. When such a system is actually in sight, any immediate addition to the generating plants of mines likely to be affected by the change could be provided for by a machine such as described, which on conversions of the systems, could at once resume its original role as a motor.

The Problem of the Gas Turbine.[1]

By Dugald Clerk, M.Inst.C.E.

The wonderful success obtained by your distinguished Past-President, the Hon. C. A. Parsons, and his many able followers with the steam turbine in its various forms, has naturally attracted the attention of engineers to the apparently analogous problem of the internal combustion turbine. Accordingly, much mathematical and engineering ability has been recently devoted to the subject—so far, I am sorry to say, without concrete result. In this subject, as yet, the dreams of the theorist obstinately decline to realize themselves in tangible iron and steel.

I have not been able to find any gas turbine in a state of effective rotation doing useful work, though I have noted many statements in the press to the effect that some wonderful German, French or Italian gas turbine had worked, or was about to work, in such manner as to relegate the ordinary cylinder and piston gas engine to the museum with which many engineers used to threaten the steam engine. One gas turbine only has really rotated within my own direct knowledge. It was designed by Mr. F. W. Lanchester, of Birmingham, to operate with exhaust gases from one of the petrol engines used in his well-known motor cars. He assured me a few days ago that it really rotated at a high speed, and made a loud shrieking noise, but only gave, he said, a total brake horse power equal to that capable of being evolved by two bluebottle flies. This power he did not consider satisfactory.

Speaking seriously, it does seem remarkable that so much interest should be taken by so many able men without any sort of result in practice. Why is this? I propose to-night to answer the question in so far as I can. It appears to me the most of those who have written on gas turbines, and have even designed and patented them, have given too little weight to certain differences between the steam and internal combustion engine problem. Many, indeed, have assumed that the solution of the gas turbine problem is the easier of the two, and that few difficulties exist which have not already been met and conquered by Mr. Parsons in the steam turbine.

Many distinguished men have been of this opinion; and even Mr. Parsons himself, so early as his first turbine patent (No. 6,735 of 1884), appears to have been of opinion that the hot gas or internal combustion turbine presented practically the same problem as the steam turbine. In his specification he made the following statement:

1. *Journal of Gas Lighting.*

Motors according to my invention are applicable to a variety of purposes, and if such an apparatus be driven, it becomes a pump, and can be used for actuating a fluid column, or producing pressure in a fluid. Such a fluid pressure producer can be combined with the multiple motor according to my invention; so that the necessary motive power to drive the motor for any required purpose may be obtained from fuel or combustible gases of any kind. For this purpose I employ the pressure producer to force air or combustible gases into a close furnace of any suitable kind, such as is used for caloric engines, into which furnace there may or may not be introduced other fuel (liquid or solid). From the furnace the products of combustion can be led, in a heated state, to the multiple motor, which they will actuate. Conveniently the pressure producer and multiple motor can be mounted on the same shaft, the former to be driven by the latter; but I do not confine myself to this arrangement of parts.

Clearly here Mr. Parsons intended to apply his invention to the gas turbine as well as the steam turbine; and in this paragraph he outlined the fundamental idea of nearly all subsequent proposals of gas turbines. Many other inventors have followed him, but I may only mention two well-known names—those of Ferranti and Stodola. Both have proposed turbines similar to this, with more or less elaboration, as well as other modifications intended to overcome certain difficulties.

In a very able paper read before the Institution of Mechanical Engineers last year, Mr. R. M. Neilson discusses various cycles of operation which can conceivably be applied to gas turbines, and he calculates the efficiencies of these cycles in various combinations. More recently, too, the subject has been exciting great interest in America, and very interesting articles are to be found in the *Engineering Magazine*, by Dr. Charles E. Lucke and Prof. Sidney A. Reeve. These gentlemen take somewhat opposing views of the position of the problem.

In most of the recent discussions upon gas turbine problems, it has been recognized that the temperatures possible in the cylinder gas engine are impossible for the gas turbine. It has been fully proved by many investigators (including myself) that the temperature quite common in ordinary gas engine practice ranges as high as 2,000° C., though in the best practice, for most economical results, 1,500 or 1,600° C. appears to be an upper limit. With these temperatures, a first-class modern gas engine of about 50-horse power will give an indicated efficiency of 35 per cent. At the same time, the negative work of the cycle is so low that the mechanical efficiency of the engine may be as high as 86 per cent., or even more. If one realizes what the temperature of 2,000° C. means, it becomes very evident that no turbine constructed either on the lines of Parsons or Laval could possibly be made to work with continuous supply of such gases, as 2,000° C. is considerably above the melting point of platinum. It is much higher than the temperature at which cast iron flows from the crucible, or, indeed, the temperature of the interior of the blast furnace. Any blades of iron, steel, or in fact of any other material, even firebrick itself, become fluid or semi-fluid at the temperature. It is obviously hopeless, therefore, to attempt in the gas turbine temperatures which are quite feasible in the cylinder engine. This fact, as I have said, is generally recognized. It is accordingly said, by those who take a favorable view of the gas turbine, that it is necessary to supply the turbine with gases at a much lower temperature. Mr. Neilson fixes the temperature of 700° C. as one which steel turbine blades would probably stand without too rapid deterioration. I fear that on this point I must differ from him, because, in my experience. oxidation of steel (and even iron) is a fairly rapid process at this temperature. Nothing new has been proposed as to the thermo-dynamic cycle of the gas turbines, so that all reasoning upon efficiencies depends upon the deductions already made from internal combustion engine practice.

Seeing the impossibility of constructing a turbine with materials to stand a high temperature, many have proposed to convert high temperature into kinetic energy, so that instead of having work stored up in the gas in the form of heat, the heat shall disappear and the energy of the heat be transformed into motion of the gaseous particles at a high velocity. Such proposals, then, include the compressing of a gaseous mixture to (say) 50 pounds or 60 pounds above atmosphere; the igniting of that mixture within a combustion chamber at constant pressure; and the expansion of the mixture through an expanding jet of the Laval type, so as to drop the temperature and obtain its equivalent in kinetic energy or velocity of the gaseous particles. The rapidly moving particles at the relatively low pressure and temperature are then allowed to impinge upon rapidly rotating blades of sickle configuration, and they are supposed to give up their energy of motion to the blades, and so expend work upon the turbine. This appears to be the most feasible of all the gas turbine proposal, so I will proceed to examine it a little more minutely.

Success by this cycle of operations requires: (1) A rotary or turbine compressor of high relative efficiency. (2) An expanding nozzle which shall insure that free expansion is quantitatively equivalent to adiabatic expansion behind a piston. (3) A rotating turbine of such construction as to secure very high efficiency of transformation of kinetic energy of the moving gas into effective work available at the turbine shaft.

Assuming air to be the working fluid, and the specific heat to be constant through the temperature range, it is easy to calculate the efficiency of the Joule or Brayton cycle, that these operations in effect represent. It would be useless to attempt to work a turbine at a pressure so low as to be relatively inefficient compared with the gas engine, so I have chosen a Joule cycle of (say) 48 per cent. ideal efficiency, which in a cylinder gas engine would probably give in practice about 30 per cent. indicated efficiency. For this ideal efficiency, the pressure of compression would require to be 141 pounds per square inch absolute. To give power with a reasonably small pump, I shall assume a maximum temperature of 1,700° C.—that is, assuming a perfect compressor and a perfect nozzle expander, the temperature would only fall from 1,700° C. to 750° C. Plainly, this temperature would be too high for a Laval disk with blades. In order to get a reasonable temperature on expansion, it would be necessary to assume a maximum temperature in the combustion chamber no higher than 1,000° C.; and this would bring down the temperature after complete expansion to about 500° C., which, no doubt, steel turbine blades can be expected to stand for some considerable time.

With these assumptions, however, the gas turbine would not be very economical as compared with cylinder engines, even assuming all difficulties overcome. The theoretical and practical difficulties, however, are very serious indeed. To begin with the question of an efficient air compressor. I am not aware of any turbine compressor capable of compressing up to 140 pounds absolute from atmosphere with anything like 60 per cent. efficiency. Before success could be attained, this efficiency of compression (so far as diagram is concerned) should be at least 90 per cent., in order to allow for unavoidable mechanical and other losses in the subsequent processes. It has, it is true, been proposed to substitute cylinder compressors operated from the turbine, instead of turbine compressors; but this, it appears to me, would be equivalent to abandoning at once all the advantages of the turbine principle. If reciprocating cylinders are to be used for compressing, there is no objection to using them also for expanding. No gas turbine with cylinder compressors could, in my view, succeed.

Assuming, however, even 90 per cent. efficiency from a turbine compressor, and assuming that we have a compressed gaseous mixture burning freely in the combustion chamber at the desired pressure and temperature, we have yet to face the problem of the expanding nozzle. It is always assumed that, with the use of an expanding nozzle, temperature drop can be as certainly attained as with an expanding piston in a cylinder. This, it seems to me, has been by no means proved. You will all recollect Dr. Joule's famous experiment with two vessels immersed in water and connected together by a pipe having a stop cock upon it. Air was compressed into one of the vessels, the water round the vessels stirred, and equilibrium obtained, while the other vessel was rendered as vacuous as possible. The stop cock between the two vessels was opened, and it was then found that, when the water was stirred again, no disturbance of the equilibrium ensued. This, of course, meant that though heat was lost in the one vessel—giving velocity to the gases—it was gained in the other by the impact of the gases against the walls.

Joule modified this experiment by placing the two air vessels in separate water containers. He then found that the temperature of the one dropped, due to expansion, but the temperature of the other rose as much as the first dropped. Apply this experiment to reasoning on the behavior of the flame in an expanding nozzle. Assume the two vessels to be connected by a Laval nozzle, and assume that while in the nozzle the gases experienced the full temperature fall due to adiabatic expansion. Immediately, however, on contact with the walls of the second vessel, the velocity of the particles would be stopped, and the temperature would be restored to a point somewhat above the original temperature—that is, the mass of expanding flame in the pressure vessel would gain heat by the amount the first vessel lost. This is the result of the final process. It will be easily recognized that to obtain a sufficient temperature drop in an expanding nozzle, necessitates the practical absence of turbulent motion of every kind—that is, to expand adiabatically, the jet must be so constructed that there is an absolutely smooth flow from high pressure to low, and no impact [or loss of velocity from any cause whatever. So far as I understand expanding

jets, no adiabatic expansion so perfect as this has ever been obtained.

Assume, however, that the efficiency of expansion in such a jet is (say) 90° per cent. We now come to the question of the efficiency of conversion by the turbine blades. In many calculations from diagrams it is assumed that the efficiency of conversion of motion into work is practically perfect. This, however, is by no means the case in present turbines. Even the steam turbine, high as its efficiency is, compared with the reciprocating engine, has no very high efficiency of conversion in any of the forms of turbine that are at present on the market. That is, if we assume a mass of gas to exist in a compressed state in a reservoir, and we choose to expand this mass of gas in two ways—for the sake of comparison, (1) behind a piston, and (2) by means of a Laval jet and turbine—we shall find that the efficiency of conversion of the turbine, when once high velocity is attained, does not exceed 80 per cent. In this respect the efficiency of conversion of rotating turbine blades is inferior to that of a moving piston in a cylinder. The reason of this is obvious. It is impossible to so arrange the impact of a rapidly moving gas with a turbine blade or blades in such a manner as to entirely avoid any turbulent motion. The impact, for example, of swiftly moving gases on a fixed surface ultimately results entirely in turbulent motion, which restores to the gas or to the blade struck all the heat which has disappeared in temperature fall due to adiabatic expansion. What is true of a fixed blade is to some extent also true of the moving turbine blades. A certain proportion of the energy existing in the gas in the form of motion is inevitably lost whenever this gas comes into contact with any solid surfaces. So much is this the fact that, in designing steam turbine blades for any type of turbine, the shape of the blades, the shape of the space between the blades—both moving and fixed blades, or fixed jet and moving blades—is of the first importance; and it has only been found by experiment that certain shapes of blades and passages have a much higher efficiency of conversion than other shapes. In this respect, too, the turbine principle is inferior to the cylinder and piston. In a cylinder, with gases expanding behind the piston, the efficiency of expansion may be considered to be 100 per cent., and even an efficiency of compression in many gas engines is also the same order. I do not here refer, of course, to heat losses due to conduction, or anything of that kind, but to efficiency of adiabatic compression or expansion.

Although the efficiency of expansion is relatively low for gases in steam turbines, yet the turbine offers a great advantage in total work obtained from steam. This is due to the fact that the turbine avoids initial condensation; and, further, it permits of the utilization of a very long range of expansion at the low pressure end, which is not available in the case of steam engines. By saving, therefore, in minimizing initial condensation, and in obtaining added work from pressures wasted in the ordinary steam engine, the Parsons steam turbine more than compensates for any inefficiency of expansion as compared with the cylinder engine. It is well known, however, in turbines of practically all constructions, including that of Mr. Parsons, that the efficiency of the steam turbine at the high pressure end is not so great as that at the low pressure end. This is partly due to the difficulty of adjusting the velocity of blades to suit the necessarily varying velocities at different points of the flow of the steam. This, however, is a small difficulty with the steam turbine, but a very considerable one with the gas turbine. Compared with cylinder expansion, I cannot see how it is possible, with present knowledge, to obtain an efficiency of conversion in a gas turbine greater than 80 per cent. This, of course, is partly due to the high velocity of the issuing hot gases.

To produce an efficient gas turbine, therefore, on the favorite cycle so much discussed recently, it is necessary first to have, as I have said, a very efficient compressor, a very efficient expanding nozzle, and a very efficient conversion when the moving gases strike the turbine blades. Using the numbers I have suggested, of 90 per cent. efficiency of compression, 90 per cent. efficiency of nozzle expansion, and 80 per cent. efficiency of conversion in the turbine, we have, with a cycle having negative work equal to 0.4, these efficiencies: To get 0.4 of work in compression, we shall require 0.445 of work put into the compression. On expanding in the nozzle, we shall obtain 0.9 only of the total energy of the flame gases in the shape of kinetic energy; and of that 0.9 we shall only get 0.8 returned in the shape of available work by the turbine part. That is, we shall get a total work from the turbine of 0.72; and deducting the negative work, $0.72 - 0.445 = 0.275$. That is, from a cycle which should give us 0.6 in work, we shall only get 0.275, or about 22 per cent.

The practical efficiency of an engine of this kind will only be 22 per cent., even assuming the high efficiencies of compression and jet expansion which I have mentioned. In my view, no such efficiencies of compression or jet expansion are at present known; and accordingly there appears no liklihood of the production of any gas turbine which can rival the reciprocating gas engine in efficiency and economy. To produce such a turbine requires the solution of three problems: (1) An efficient turbine compressor, comparable in efficiency with cylinder compression. (2) An efficient nozzle expander with a higher efficiency than 90 per cent. (3) An efficiency of conversion of kinetic energy of the moving gases into work delivered at the turbine spindle of greater than 80 per cent. Either of these problems must be satisfactorily solved, or else new materials discovered which will stand temperatures which at present melt firebrick. The outlook, I fear, is not hopeful.

This thermal efficiency of 22 per cent. assumes no losses in the combustion chamber due to heat conduction, no losses in the expanding jet due to heat conduction, and no losses in the turbine itself from the same cause. Considering the losses in gas engine cylinders of small size, it would not be too much to allow in a turbine a heat flow loss of at least 25 per cent. This, of course, reduces the efficiency from 22 per cent. to 16.5 per cent. In arriving at this figure, I have assumed that no greater loss would be incurred from heat flow in the turbine than in the cylinder engine; but even with the reduced temperatures when striking the turbine, the very fact of requiring a reservoir for combustion to operate, and the forcing of the whole of the hot products through a relatively small nozzle, necessarily mean greater loss than I have assumed. Assuming, however, no more loss than I have given, an engine with an efficiency of only 16½ per cent. of the total heat given to it could not compete with internal combustton motors of existing construction. It may be said that the advantages of continuous rotation are so great that even at this low efficiency the gas turbine would be successful. Personally, I doubt it very much, because the mechanical difficulties with gas turbines would be much greater than the mechanical difficulties of the steam turbine. In all steam turbines, as you, I am sure, know, it is necessary to work with relatively small clearances between the tips of the blades or shrouding and the inclosing casing. This is also true as to endwise clearance between the fixed and moving blades. Comparatively, small clearances are necessary for economy.

The use of temperatures even so high as 400° or 500° C., by introducing unequal expansions, greatly increase the difficulty of obtaining economy. No doubt if a plentiful supply of relatively low temperature gases under considerable pressures could be obtained, these gases might with advantage be expanded in a nozzle, and used to operate a turbine. To carry this idea into effect has already been attempted, as I have said, by Mr. Lanchester; and there is some hope of operating in this way. I fear, however, that the temperatures of the gases in the exhaust in the gas engine are too high, as they stand, to be used. Gases, however, from an exhaust or air supercompression engine, such as I have lately been working with, could no doubt give considerable efficiencies in turbines. I do not see, however, any solution for the gas turbine problem here, because the amount of energy available for the turbine after the gases leave the gas engine is too small for consideration in connection with any really high power machines.

Some of the difficulties I have discussed with you have been mentioned by Dr. Lucke. He adopts the view that jet expansion is not so efficient as piston expansion; and here I agree with him. No doubt the type of jet expansion has to be carefully considered, and the efficiency of a jet as a means of converting the expansion from a high pressure to a low, into kinetic energy, depends entirely upon its configuration, and the design of the proper areas and relative lengths for the nozzle. All this, however, is as yet a relatively new field; and much study will be required before any certainty can be obtained in the design of expanding jets. Professor Reeves, in another able article which I have already mentioned, differs from Dr. Lucke, and considers that he has overstated the difficulties of the expanding jet. He accordingly takes a more favorable view of the turbine problem. There is a great deal of truth, however, in what Dr. Lucke has said. Even the best expanding jets yet known appear to have a low efficiency; and nothing is known of the efficiency of expansion starting from flame temperatures. Apart from the mechanical efficiency of the expansion, as I have already pointed out, the loss of heat due to conductivity will be great in such nozzles. I quite agree with Professor Reeve, however, that the more hopeful line for the gas turbine lies in the use of steam to provide the working fluid under compression without a compressor, and in the heating of this steam when produced by a very small quantity of combustible mixture of gas and air under pressure. Such a turbine would be a compromise between what I may call the flame turbine and the steam turbine, and it presents more possibilities; but its efficiency

would not be high, although, no doubt, such a machine could be got to operate mechanically with fair success.

This line of work depends upon the fact that negative work may be greatly reduced by using steam as working fluid, when steam is heated highly by the internal combustion of a relatively small amount of inflammable gas and air. This proposal is more hopeful; but, for success, even it requires temperatures, in my view, too great for existing turbines to stand with economy. This proposal may be considered to be analogous to that of an excessive superheat, as used in an existing steam turbine.

Many methods have been discussed which depend upon the use of regenerators. I have a great distrust of regenerators, so far as engine work is concerned. Many able men have proposed regenerative contrivances, from the time of Stirling, in 1817, down to the present day; but I am not aware of any actual working engine which has ever succeeded in practice using a regenerator.

From what I have said, you will see that my view of the future of the gas turbine is not favorable. But, nothwithstanding, the subject is so fascinating that many inventors and scientific men will doubtless continue to investigate the problem; and possible new solutions may be discovered which are not dreamt of to-day. I am the last man in the world to depreciate daring in any practical and scientific work; but I would advise the junior engineers—members of our Institution—to avoid the subject, except as a scientific study. I fear there is little hope for a young man to make a position and a business success of any internal combustion turbine, so far as present knowledge carries us.

The Cast Iron Pipe Trade.

Iron Age notes that the prolonged activity in the cast iron pipe trade is one of the interesting features of these prosperous times. It was once a tradition of the iron trade that cast iron pipe was a laggard in the march of iron products, and that its activity was an indication of the approaching close of a prosperous period. But this time-honored belief has been dissipated by the events of the past 2 years. Cast iron pipe has broken its record and has shown that it can be in heavy demand concurrently with an increasing consumption of other iron and steel products. One of the surprises of the iron trade in the slump of 1903–04 was the maintenance of dividends by the leading cast iron pipe interest, but an even greater surprise was the advance in the rate of dividend on its preferred stock to the highest rate provided for in its charter when other iron and steel companies were just beginning to recover from the depression in trade which they had experienced, and this was speedily followed by the declaration of an initial dividend on the common stock. In the case of some industrials action of this kind might be regarded with suspicion, but the management of the company referred to has been so conservative that no doubt is entertained that the dividends declared have been much more than earned. It may, therefore, be quite safely taken as very strong evidence of the existence of exceptionally prosperous conditions in this branch of the iron trade.

The assertion has been made frequently this fall by men of long experience that never before had they known such an active demand for pipe on the eve of winter. The foundries are closing the pipe laying season with order books so well filled and the pressure for delivery so strong that they have been unable to accumulate any stock of the standard sizes to fill small orders for prompt shipment. The demand of this character has been insistent, indicating that numerous consumers will be unable this fall to make improvements which they had projected. An illustration of the high tide of activity now being realized in the pipe trade is presented in the case of a pipe manufacturer who some time since purchased a foundry that had long laid idle, for the purpose of wrecking it and selling the equipment, but before doing so he found his own works becoming so crowded with orders that he decided to repair the old plant with a view to temporary operation and it is now running on full time with several months' employment assured.

So encouraging are the prospects that old plants are being remodeled or enlarged that they may be able to turn out an increased product. New foundries are also projected, some of which will be built on a large scale. In this movement the South is conspicuous, the most ambitious project being that of the Tennessee Coal, Iron and Railroad Company. The entrance into the pipe trade of a pig iron producing company will introduce a new element whose development will be observed with interest. Hitherto the cast iron pipe makers have not been closely affiliated with pig iron manufacturers. All have purchased their iron in the open market. In no other branch of the iron trade handling such great quantities of raw materials have consumers been so dependent upon outside sources for their supplies. It may be assumed that if the Tennessee company makes a success of its proposed pipe foundry it will be found desirable by the large pipe manufacturers to own blast furnaces and thus control their supply of raw material. There are indications that the use of direct metal from the blast furnace will hasten this tendency. It is being successfully done by pipe manufacturers on the other side of the Atlantic.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

SUPERINTENDENT STEWART of the Adams (Mass.) Gas and Electric Light Company declares that the local authorities require a very good margin respecting the public lighting service, as between what they want to receive and that for which they will pay.

MR. G. G. ATKINSON says that he will expend not less than $30,000 next season in bettering the condition of the Niles (Mich.) gas plant.

THE Columbus (O.) *Journal*, of November 19th, said that a rumor which had the appearance of being fairly well based on fact was well circulated in the city that Mr. Randall Morgan, for the United Gas Improvement Company, of Philadelphia, had designs on the Columbus Gas Light and Heating Company, and was attempting to purchase a controlling interest in its stock. As the officials of the local Company absolutely deny the story, and as the U. G. I. does not invest in natural gas properties, the story may be dismissed without further comment. Next month the Directors of the Gas Company will meet to declare the regular semi-annual dividend of 3 per cent. on the preferred stock, which will be paid January 15. At the same time they will probably arrange to pay the $37,500 interest due January 1, on the bonds of the Columbus Gas Company. There has been much talk that the Directors would default interest on these bonds, but it can be said, on authority, that there is nothing in this just now. The entire matter of these bonds will be passed up to the stockholders of the Columbus Gas Light and Heating Company next April. The stockholders will be asked by the Directors whether or not they desire these interest payments kept up. If the stockholders say they do not, there will be an end of it, as the Directors will obey instructions, and let the bondholders take the old artificial plant. If the stockholders say the interest is to be paid, then it is probable that the Directors will ask that bonds be guaranteed by the Columbus Gas Light and Heating Company, thus putting an end to any further complications regarding them. The January interest will be paid and then the further payments will rest on the decision of the stockholders of the controlling Company.

THE proprietors of the Vincennes (Ind.) Light and Power Company have established a minimum rate charge of 25 cents per month.

WE are indebted to a correspondent in Milwaukee for the following respecting Mr. Stephen Aldridge, who had been in the service of the Milwaukee Gas Light Company for something like 50 years: "Stephen Aldridge, the oldest employee of the Milwaukee Gas Light Company in point of service, and a resident of Milwaukee since 1857, died at his residence 95 Twenty-sixth street, the morning of November 16th. Mr. Aldridge contracted a cold upon the occasion of the ceremonies attending the driving of the last rivet in the huge gasholder of the new plant of the Company, in the Menomonee Valley, which services were held November 6th. At the ceremony he was an interested and interesting participant, and greeted the members of the Milwaukee Press Club, who were guests of the Company on that occasion. Colonel E. G. Pratt, toastmaster at the banquet, introduced Mr. Aldridge as the oldest living employee of this Company, and the honored guest arose at the banquet to correct a date which had been given as to his arrival in Milwaukee. Mr. Aldridge entered the service of the Milwaukee Gas Light Company 48 years ago, and a few months ago, in a personal letter of appreciation of his long and faithful service, Col. Pratt informed him that he had been placed on the retired list of the Company with full pay, at the same time expressing the hope 'That your life may be spared for a great many years to come, and I want you to feel that you are perfectly at home about this office, or in any of the works or buildings of the Company—in fact, that you are one of us.' Mr. Aldridge was a native of Tunbridge Wells, Kent, England. He would have been 75 years of age on May 4, next. He landed in the United States

in the spring of 1857, coming directly to Milwaukee, where he entered the service of the Gas Light Company, a small concern then, struggling for existence. In his own account of his work for the Company, Mr. Aldridge wrote: 'I have worked at the Southside gas works; in the retort house, under Supt. Hiram Merrill and at the works on the Eastside, and I laid brick on the second tank built in this city. One noon, while engaged in laying brick, Mr. Hayden caught me taking the statement of the large meter, as I used to go there to eat my dinner. He said, 'Boy, let me look at that paper you have in your hand.' I thought, of course, it was all off with me, as I had no business there. He looked it over and asked, 'Who taught you this?' I replied, 'No one.' He then asked me if I would like to take city meters and have steady employment the year around. I told him that I would, if he thought I was capable of doing the work. He told me to pack up my tools and go up to the gas office, which was then on Michigan street. I was employed there when the first draft for the Civil war came. From that office I witnessed the famous bank riots, and saw the cobblestones fly through the air. About that time a man was giving exhibitions at a room next to the Academy of Music, with a cast iron steam man. He was always behind with payments for gas used, and I was finally sent to shut off the meter. I had to crawl under a show case to reach the meter, and just as I had turned the gas off, I was raised by the coat collar and dumped into the gutter.'"

THE social success of the season in Denver, Col., so far, seems to have been the fifth annual ball of the employees of the Denver Gas and Electric Company, which was held in Elk's Hall, Exchange Building, Denver, the evening of November 22d. Those in charge of the affair were: Manager, Lawrence Brown; arrangements, E. Tammany; reception, Z. P. Loftus.

SOME weeks ago there was installed in the power house of the Little Rock (Ark.) Railway and Electric Company, a Curtis steam turbine. The machine is a 1,500 kilowatt, 2,500-horse power, with a 3-phase generator, and all the latest devices for saving use, either from a power standpoint or point of service.

WRITE to the General Gas Light Company, of Kalamazoo, Mich., for a copy of its "post card" carrying the title "Isn't it Most Annoying!"

THE Jeffrey Manufacturing Company, of Columbus, O., has recently established a New England branch, with offices in the Oliver Building, 141 Milk street, Boston, Mass. Mr. H. C. Freeman, for many years with the home office at Columbus, is the engineer in charge. Catalogues, prices and specifications covering the Jeffrey complete line can be had on application to Mr. Freeman.

MR. D. H. NEWMAN, since 1899 the Superintendent of the Canisteo (N. Y.) Gas Company, died at his home in Canisteo, the morning of November 17th. His wife and 3 sons survive him.

MR. W. H. HIGGINS, Manager of the Kokomo (Ind.) Artificial Gas Company, has arranged for the placing of several miles of mains between seasons.

MESSRS. ELLIS and Heath, the new owners of the Gainesville, Tex., plant, will expend a considerable sum in putting it in condition. It certainly needed an overhauling.

A CORRESPONDENT in Des Moines, Ia., forwards the following under date of the 24th November: "The Mt. Ayr Gas Company was voted a franchise this week, the vote being 177 in favor, 40 against. The election was very quiet. While some work was done in opposition to the franchise, practically none was done for it, and the apathy that marked the election was largely due to the fact that its passage was regarded as a foregone conclusion. It is the expectation that work will begin in a little over a week, and that the plant with its 24,000 feet of mains will be in operation by January 15. The Company has taken an option on the W. M. Calfee property, north, across the tracks from the depot, and no doubt the plant will be located there. The directors and officers and several others, who have perhaps nothing more than local pride respecting the venture, visited Osceola, Ia., where they inspected the workings of a similar plant lately installed there. The contract for the construction of the plant has not been let, but it has been supposed all the time that the American Construction Company of Des Moines, whose General Manager, M. E. Springer, worked up the gas proposition here, will do the construction work, if he and the local gas men can get together on a price. The directors, elected at once after the stock was subscribed some weeks ago, are: F. E. Sheldon, Bert. Teale, A. R. Shrimplin, H. H. Tedford, and M. A. Harrison. The other officers are: President, F. F. Fuller; Treasurer, G. E. Snyder; Secretary and General Manager, M. N. Harrison.

AT the shareholders' meeting in the Buffalo (N. Y.) Gas Company the Directors elected were: A. C. Humphreys, Robert L. Fryer, Wm. W. Randolph, Robert C. Pruyn, F. D. Locke, H. L. Clark, Stephen Peabody, Henry Seligman, George W. Pepper, Emil Guillandeau and W. S. Riselay.

AT the annual meeting of the Board of Trustees of the Bethlehem (Pa.) Consolidated Gas Company the reports submitted by the General Manager, Mr. W. J. Flick, showed that the Company had prospered well during the twelvemonth. The special mention was respecting the main extensions to and through Northampton Heights, where the Bethlehem Steel Company is erecting many houses for the tenancy of its workmen.

THE Acme Sunlight Gas Company has been incorporated in New York by Mr. J. De Wyckoff and Mrs. M. E. F. Wallace and Lilian H. Andrews. It is capitalized in $200,000. The incorporation is in the nature of a rehabilitation of a hodge-podge, cheap incandescent burner concern.

MR. C. E. BEACH, formerly of the Chicago Heights Gas Company, has accepted a responsible position with the East St. Louis (Ills.) Gas Company.

THE Massachusetts Gas Companies, of Boston, Mass., are negotiating with Messrs. Mayhew and Lancaster with a view to securing their coal supplies from the Cape Breton Coal Company when the present contract with the Old Dominion Coal Company expires. The latter contract expires in 1907.

THE creditors of the defunct Nantucket (Mass.) Gas and Electric Light Company will likely receive a "dividend" on their claims not to exceed 5 per cent.

THE Citizens Manufacturing Company, to operate a gas, electric light and ice producing factory in De Land, Fla., has been incorporated. Its officers are: President, O. B. Wilson; Vice-President, S. B. Jordan; Secretary, J. E. Bigelow; Treasurer, A. H. Ryland.

THE proprietors of the Asheville (N. C.) Company have announced that a cut of 25 per cent. in the selling rates will rule after the 1st prox.

THE Port Jervis (N. Y.) Electric Light, Power and Gas Company announces that it will hereafter charge 12 cents for renewing ordinary incandescent electric lighting bulbs.

MR. H. B. NEWMAN has been appointed Superintendent of the Canisteo (N. Y.) Gas Company, vice his father, the late Mr. D. H. Newman. The appointment was made through the advice and counsel of Mr. W. T. Morris.

THE plant at Palestine, Tex., is likely to be a fact. Mr. J. H. Grant is evidently a believer in the enterprise. Mr. Grant is a Palestine Alderman.

Cassier's Magazine states that the Ball and Wood Company, steam engine builders, have recently added to their works at Elizabethport, N. J., a plant for turning out welded flanged pipe and pipe bending. This company, in its steam engineering work, has noted the growing demand of contractors and engineers for a pipe joint to withstand the higher steam pressures coming into use, and the increasing preference for superheated steam, and its purpose is to meet these requirements. It will do no pipe fitting and undertake no piping contracts, but is prepared to quote prices and fill orders for the material used in this work. Not only in the use of steam, but of air, gas and water, modern engineering finds its most economical applications in high pressures, and a joint in which the flange is neither screwed nor expanded on the pipe, but is welded to it and forms a part of it, appeals to engineers. The flanges in the Ball and Wood pipes are made of wrought steel of the same grade of metal as the pipe, so as to have homogeneity in the flange and pipe after welding. In their new building their tools are driven electrically. Heavy, high speed lathes, facing tools and multiple drills have been installed, and electric cranes, oil furnaces and modern hammers complete the equipment. The joints are tested under hydraulic pressure to the required specifications before shipping, and this test is stenciled on the pipe. To distinguish it from others on the market, the Company has given its trade name, "Ballwood," to this joint.

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, DECEMBER 4, 1905.

The Market for Gas Securities.

There was nothing, in fact, is nothing, to say about the market for city gas shares in the week. Consolidated is good at the rated price certainly, and the State Commission will not injure its value one bit. Bulwarks are better than promises. Brooklyn Union shares with Consolidated, if it does not more than share with it.

In out-of-town securities no exceptional moves were noted. Cincinnati Gas and Electric keeps going on evenly in strength, the quotation at the close last week being 105½ to 106. The earnings of the Laclede Company, of St. Louis, show very much more than steady gains; in fact, quite enough to keep pace with the increasing interest charges.

Mr. John S. Maxwell, referee in bankruptcy, United States District Court, Eastern District of Milwaukee, announces that on the 8th inst. he will sell 48 shares of stock in the Fred. Bredel Company, of Milwaukee, which stock was pledged by the Bredel Company to the Laclede Firebrick Manufacturing Company, of St. Louis. The sale will be held in room 434, Post Office Building, at noon of the date mentioned. Peoples, of Chicago, is steady to strong, even if Mayor Dunne is in the chair.

Late news to hand is that the General Gas Light Company, of Kalamazoo, Mich., has securities that other concerns wish to control. The Company claims that, while its stock is for sale, it can also deliver any goods that consumers want before February 1st, wherefore this explanation is given.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 4.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	Capital.	Par.	Bid.	Asked.
Consolidated	$73,177,000	100	173	173⅛
Central Union, Bonds, 5's	3,000,000	1,000	108	110
Equitable Bonds, 6's	1,000,000	1,000	..	105
" 1st Con. 5's	2,300,000	1 000	118	120
Mutual	3,500,000	100	275	290
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	111	114
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	98	104
Northern Union, Bonds, 5's	1,250,000	1,000	105	107
New York and East River Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106⅛	108⅛
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
Bonds, 1st Mortgage, 5's	1,500,000	1,000	111	114
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	175	185
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	3/16	¼
" ncome Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000.000	1.000	47⅛	50
Buffalo City Gas Co.	5,500,000	100	10	12
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	105⅛	106
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107½	103
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	85	..
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98⅛	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
For Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,235,000	1,000	104¼	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	110	110⅛
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104⅛	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	.	.
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1 000.000	1,000	60	65
Louisville	5,570,300	50	143	145
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	103¾	103¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	.	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104⅛	15 5¼
San Francisco, Cal.	15,800,000	100	58¼	58¾
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¾	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	300	301¼
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600 000	50	230	

NOTICE!

PLEASE read the advertisement of the Empire Gas Improvement and Construction Company, on page 915 This Company employs only high-priced and quick-workiug mechanics, and all its work is guaranteed to be strictly first class, and will be finished at time specified. A. M. SUTHERLAND,
1545-eot. tf 49 Wall Street.

NOTICE!

At the **American Gas Light Association's last meeting** one of the exhibits that interested the meter men was the improved meter and prepayment device exhibited by **The New York Improved Meter Co.** See our advertisement.
1587-tf

Position Wanted
AS SUPERINTENDENT OR MANAGER

Of a gas company, by a young married man, engineering graduate, and having nine years' practical experience in the business. Willing to take charge of everything, from making gas to office work. Salary $1,200 per year. Excellent references. Address, "SUPERINTENDENT,"
1590-3 Box 22, Ambler, Pa.

WANTED,
A Second-hand No. 3 or No. 4 Gas Exhauster,

With or without engine. Address, with particulars and price,
1589-3 "IMPROVEMENT," care this Journal.

WANTED,
TWO SECOND-HAND PURIFIERS,

8 by 10 by 3 feet 6 inches, with covers and in good condition. . . . . .
Address "M. G.,"
1589-3 Care this Journal.

WANTED.

Young man wanted, to learn gas business; must understand gas analysis and able to take C. P. readings on the bar. Address, stating age, experience, and salary expected,
1591-1 "PERMANENT," care this Journal.

GAS PLANTS FOR SALE.

We have several gas plants for sale in towns of 5,000 population. Some can be purchased on comparatively small cash payments. Write us, stating the amount you have to invest. THE GAS AND ELECTRIC DEVELOPMENT COMPANY,
1591-2 1328 CHESTNUT STREET, PHILADELPHIA, PA. 82 BEAVER STREET, NEW YORK CITY.

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.

IMPROVED AMMONIA CONCENTRATOR.

About 100 in use. Write to
STROH & OSIUS, Patentees, or
MICHIGAN AMMONIA WORKS, • Detroit, Mich.

J. F. W. JOST,
CHEMICAL ENGINEER
—IN—
GAS MANUFACTURE,
P. O. BOX 2643, PHILADELPHIA, PA.

INDUSTRIAL RAILWAY AND CHARGING CARS
For Handling Coal in and around Gas Works.
Saves 50 per cent. in labor.
Examine our system. Described in Catalogue 038.
C. W. HUNT COMPANY, West New Brighton, N. Y.

De Laval-Sturtevant Blower Set, 30 H. P.

Steam Turbine Motors
Steam Turbine Dynamos
Steam Turbine Blowers
Steam Turbine Centrifugal Pumps
Electro-Motor Centrifugal Pumps
SEND FOR CATALOGUE.

REPRESENTATIVES:

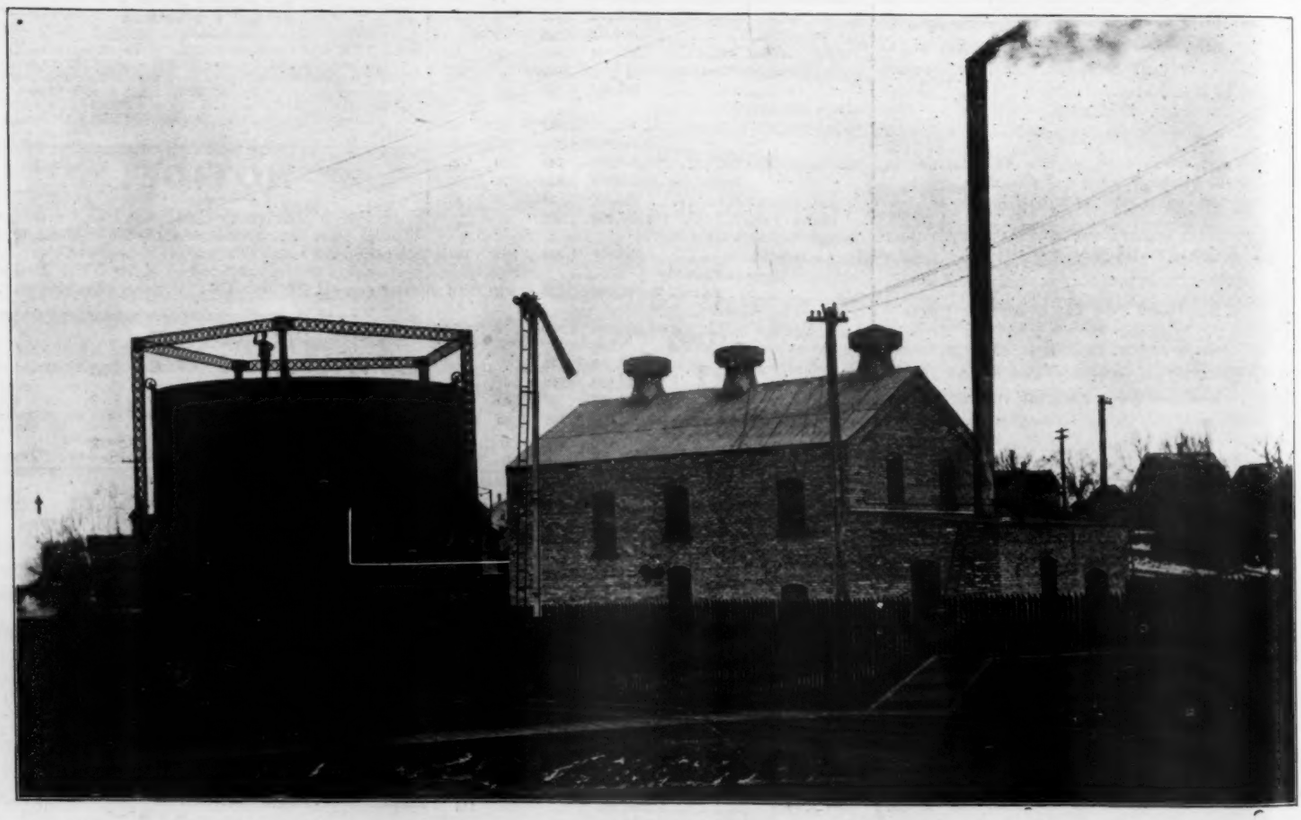
D'Olier Engineering Co.,	New York City, Philadelphia, Pa.
Chas. Garrison,	Boston, Mass.
The Turbine Engineering Co.,	New York City, Chicago, Ill.
Denver Engineering Works Co.,	Denver, Col.
Florida Electric Co.,	Jacksonville, Florida.
Dravo, Doyle & Co.,	Pittsburg, Pa.
Geo. P. Dravo,	Milwaukee, Wis.
Chester B. Davis,	Dallas, Texas.
Joshua Hendy Machine Works,	San Francisco, Cal.
Kilbourne & Clark Co.,	Seattle, Wash.

DE LAVAL STEAM TURBINE COMPANY
Works and Sales Offices, TRENTON, N. J.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,
Consulting Engineers.
Builders of UP-TO-DATE Machinery and Appliances for Coal and Water Gas Plants. :: :: :: :: ::

PLANS,
SPECIFICATIONS
AND ESTIMATES
PREPARED.

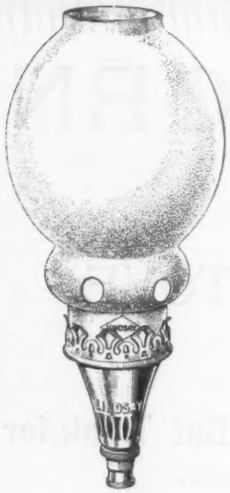
AMERICAN OFFICE:
269 Front St., East, Toronto, Canada.

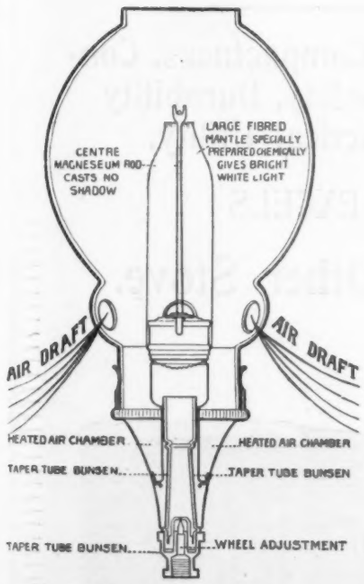


The illustration shows the main external details of the 100,000 cubic feet daily capacity water gas plant, constructed by Mr. FRANK D. MOSES, of Trenton, N. J., at Albert Lea, Minn. United Gas Improvement Company supplied the generating apparatus.

THE GAS ENGINEER'S LABORATORY HANDBOOK,
By JOHN HORNBY, F.I.C.

PRICE, - - - - - - - $2.50.
A. M. CALLENDER & CO., No. 42 Pine Street, New York City.





PATENTED MAY 19, 1903.

NOTICE.

The trade is hereby notified that the Lindsay Light Company has brought suit in the United States Circuit Court in New York against Block Light Company, for infringement of letters patent No. 728,296, granted to Charles R. Lindsay, Jr., May 19, 1903, and now owned by Lindsay Light Company.

It is due to the trade that a word of explanation be made concerning a circular now being spread broadcast by Block Light Co. The Block Light Co. alleges that the Lindsay Light Company has sent out circulars to the trade concerning the infringement to which the above suit relates, and the Block Light Co. has made this a pretext for bringing suit for damages against this Company. As a matter of fact, no such circulars were sent out by Lindsay Light Company, as the trade well knows. Although there was sufficient provocation for and an undoubted right to send out such circulars, nevertheless the Lindsay Light Company preferred to settle the matter directly with the infringing concern. It is obvious, therefore, that the Block Light Co. brought a baseless suit merely to lay a fictitious foundation for the circular which it has just issued. The Block Light Co. is in the position of attempting, by methods which will not commend themselves to the trade, to intimidate the Lindsay Light Company against asserting the rights secured to it by its letters patent.

The Lindsay Light Company has always acted upon the principle that controversies of this character should be settled, amicably if possible, otherwise in court, by the principals concerned. Now that the Block Light Co. has deemed it necessary to pursue its present course, we feel obliged to give the public friendly notice to refrain from infringement (by selling) of the Lindsay patent mentioned, since this Company will insist upon its rights being respected. The Lindsay Light Company is fully equipped, notwithstanding the great favor with which the Lindsay Light has been received by the general public, to supply all dealers, so that no occasion need arise for any dealer assuming any risk by purchasing imitation Lindsay Burners from any unauthorized manufacturers. Respectfully,

LINDSAY LIGHT COMPANY,

CHICAGO. NEW YORK.

The CABINET ACORN Gas Range.

A COMMON SENSE COOK STOVE.

THE CABINET ACORN in operation.

Does Everything But Think for the Cook.

For Beauty, Compactness, Convenience, Safety, Durability and Practical Utility,

IT EXCELS

Every Other Stove.

New Desirable Features.

- Convenient height of stove, oven and broiler.
- New adjustable valves with drop handles.
- No pilot lighters. Absolutely safe.
- All burners in sight with doors closed.
- No door springs to break.
- A plate warmer that is right.
- Broiler that equals the charcoal fire. It draws out to use and for cleaning.
- Oven opening 13½ inches high.
- A most efficient water heater incased entirely in cast iron.
- Illuminated oven. Baking always in sight.
- Oven removable, making a 6-burner Stove.

ORDER A SAMPLE.

WE HAVE MANY NEW LINES AND SPECIALTIES FOR 1906.

THE CABINET ACORN GAS RANGE.

RATHBONE, SARD & CO., { ALBANY, N. Y. / AURORA, ILLS.

HUMPHREY

Nickel Cylinder Lamps,

Used either with or without shades. Supplied with round or pear globes. :: ::

Just the lamp to offer the hesitating consumer who wants a different design.

SHIPMENTS MADE FROM

Kalamazoo, Mich.
530 Market St., San Francisco.
46 West Broadway, New York.

General Gas Light Co.

WARNING!

IF YOU USE OR SELL AN INFRINGING BURNER

YOU ARE EQUALLY LIABLE WITH THE MAKER OF SUCH A BURNER.

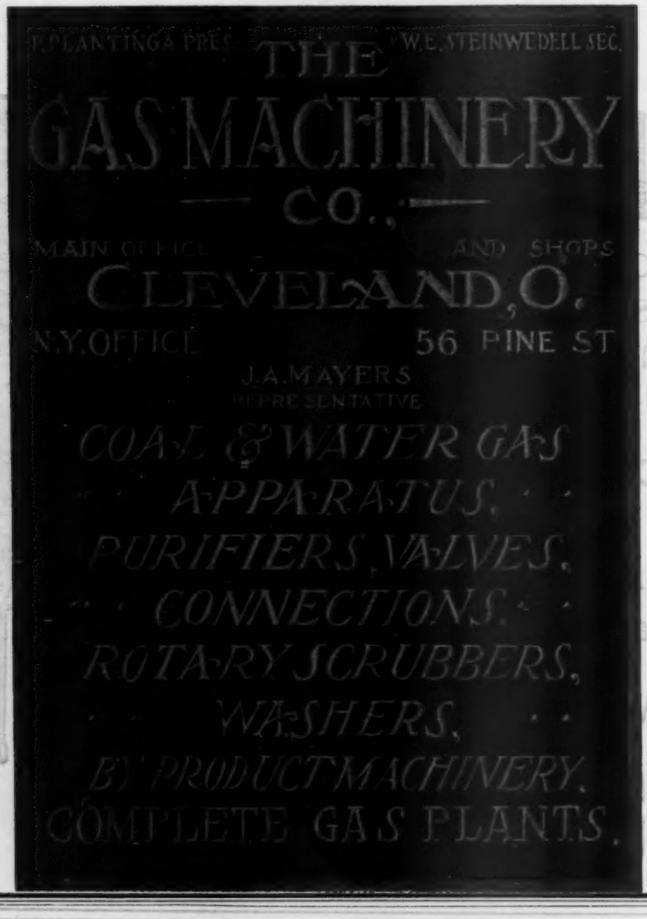
It has come to our notice that certain parties are offering for sale a Burner which is a **direct infringement of the Bray Burner. Patents were granted to George Bray & Company** on the 16th day of October, 1900, and these **patents were sustained** by a decree handed down by the Circuit Court of the United States on the 22d day of December, 1903, **in answer to a suit instituted by George Bray & Company.**

Every genuine Bray Burner is marked with the maker's name and stamped "Patented." **See that the burners you are using are so stamped,** as it means **protection for you** against any possible suit for damage, and also **protection to your consumer** against an inferior burner.

W. M. CRANE COMPANY,

1131-33 Broadway, New York, N. Y.,

We make Gas Appliances of all kinds. **Sole Agents for the United States.**



PATENTS, TRADE MARKS, COPYRIGHTS.

ROYAL E. BURNHAM,

Solicitor of Patents and Counsellor in Patent Causes.

833 Bond Building, Washington, D. C

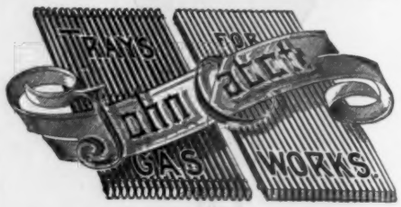
Send for Pamphlet on Patents.

1448-tf

Church's Patent Trays.

Reversible; Strongest; Most Easily Repaired.

Special Trays for Iron Sponge.



1412-1416 Adams Street, Hoboken, N. J.

We also Supply the Cheapest and Strongest

•Reversible Bolted Trays•

IN THE MARKET.

SEND FOR BOOKLET AND CIRCULARS.

Telpher for handling coal and coke at works of Worcester Gas Light Co., Worcester, Mass. Capacity of hoist, 5,000 lbs. Travelling speed, 800 feet per minute.

Telpherage

in handling all kinds of material lays special claim to economy of operation. One man can control the loading, hoisting, conveying and unloading. Obstructions heretofore considered insurmountable easily overcome. Shall we outline plan for its application to your plant? Write for booklet 53.

UNITED TELPHERAGE DEPARTMENT,

The Dodge Coal Storage Co.

PHILADELPHIA—Hunting Park Ave. and P. & R. Ry.
NEW YORK—49 Dey Street.
BOSTON—164 Federal Street.
CHICAGO—39th Street and Stewart Avenue.
PITTSBURGH—1501-1502 Park Building.
PORTLAND, ORE.—309 McKay Building.

Bristol's Recording

PRESSURE GAUGE.

For continuous records of **Street Gas Pressure.**

Simple in construction, accurate in operation and low in price.

Fully Guaranteed. Send for Circulars.

THE BRISTOL CO.,

Waterbury, Conn.

Gold Medal, St. Louis Exposition.

THE BEST are THE CHEAPEST.

HOMOGENEOUS CONSTRUCTION ~ PERFECT FINISH ~ LONGEST CONTINUOUS LIFE.

WE HAVE RETORTS MAKING GAS TO-DAY THAT HAVE BEEN IN CONSTANT USE FOR 52 MONTHS.

Awarded the Only **GRAND PRIZES** At St. Louis Exposition

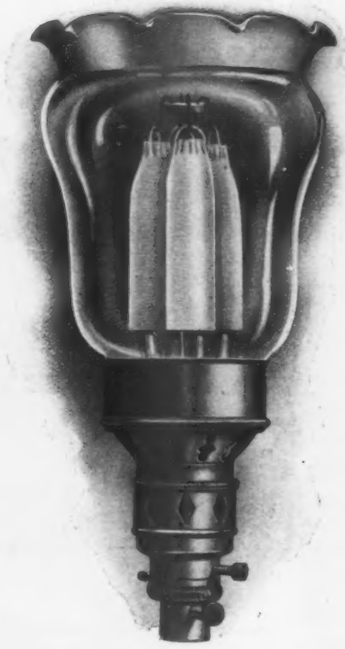
BY A JURY COMPOSED OF THE MOST COMPETENT ENGINEERS OF FOUR CONTINENTS, FOR SUPERIOR

RETORTS * GAS BENCHES * FIREBRICK.

Designs and Estimates Cheerfully Furnished.

LACLEDE FIREBRICK MANUFACTURING COMPANY,

ST. LOUIS, MO.



MARTIN MULTIPLE BURNER.

A WORD TO THE GAS PRODUCER.

EVERY producer wants his goods to show at their best.

Every gas producer wants his gas to give the best possible light—therefore he endeavors to produce the best possible gas.

But the quality of the light isn't solely a question of the gas. The gas must be right, of course, but the burner must also be right. There's the rub. How often is good gas wasted on inferior burners?

A burner which will give the maximum of efficiency is as important in the business of a gas company as the quality of the gas itself.

DOORENBOS ARC No. 1.
BEST IN THE WORLD.

The MARTIN MULTIPLE BURNER

solves the problem of burner efficiency. It's an open Bunsen, with no screens or caps to cause resistance, and it has four small mantles, which give the largest possible incandescent lighting surface on a minimum gas consumption. These are the main points, but the sum of them all is this—

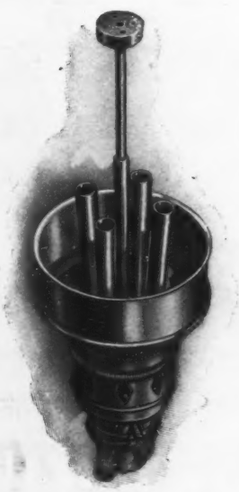
We guarantee more light per cubic foot of gas consumed than any other burner made.

It has perfect control of both gas and air, can be instantly regulated to any gas, can be used on any gas fixture, has a standard fitter, and carries any glassware.

DOORENBOS OUTSIDE ARC.
BEST IN THE WORLD.

The DOORENBOS GAS ARCS

are used exclusively by over 300 gas companies in the U. S. If you are not one of them and are having any trouble with the arcs you are using, we guarantee to stop that trouble with the use of the Doorenbos. It won't cost you anything to give this a trial. Put the responsibility on us. Write to-day for our plan.



MARTIN MULTIPLE BURNER.
NO CAPS OR SCREENS.

J. H. T. Martin Company,

INCORPORATED.

GENERAL OFFICES:

198 WEST BROADWAY,
NEW YORK.

PARKER-RUSSELL MINING AND MFG. CO.,

OF ST. LOUIS, MO.,

PROPRIETORS OF THE

OAK HILL GAS RETORT AND FIREBRICK WORKS.

ST. LOUIS OFFICE: 417 Pine Street. NEW YORK OFFICE: Aldrich Court, 45 Broadway.

WE MAKE A SPECIALTY OF WATER GAS LININGS AND CHECKER BRICK.

Half and Full Depth Benches of Our Own Design, Containing 6, 8 or 9 Retorts.

SLOPERS.--We have perfected plans of INCLINED RETORT BENCHES, designed to meet conditions prevailing in America, and constructed entirely of American materials.

We Build Benches Complete. Ready for Gas Making. Also,

RETORT HOUSES,

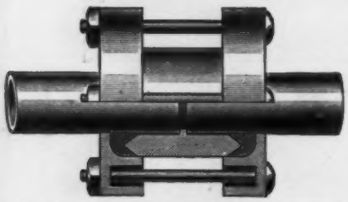
COAL and COKE CONVEYING MACHINERY.

Plans, Specifications and Estimates Cheerfully Furnished.

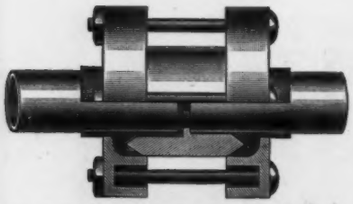
CORRESPONDENCE SOLICITED.

ALL CONTRACTS MADE AS OF ST. LOUIS, MO.

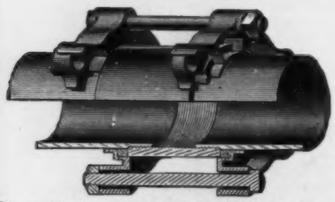
Gold Medals awarded by the Louisiana Purchase Exposition at St. Louis, for fireclay gas retorts, gas retort benches, firebrick and setting tiles.



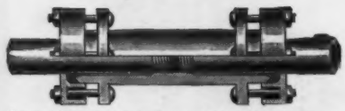
Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.



Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe.



Clamp, Style 4, for Repairing Leaks on Screw Collar.



Long Sleeve, Style 2, for Mending Broken Lines.

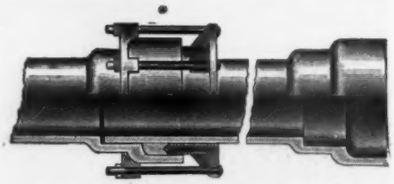
S. R. DRESSER,

BRADFORD, PA., U. S. A.,

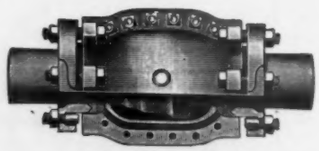
Patentee and Manufacturer of Specialties for Gas and Water Lines,

Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

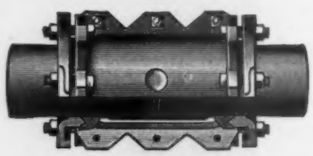
STATE REQUIREMENTS AND SEND FOR CATALOGUE.



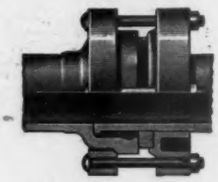
Coupling, Style 9, for Special Style Cast Iron Pipe.



Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.



Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.



Clamp, Style 4½, for Repairing Leaky Lead or Cement Joints in Cast Iron Pipe.

STEWARD'S EASTERN DEPOT.

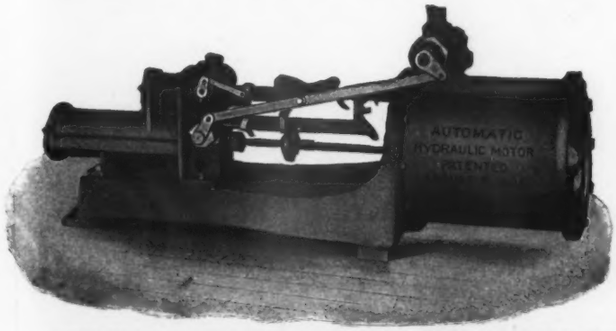
For the convenience of Eastern gas companies and dealers we now have a full stock of Steward Burners and Lava Gas Tips in New York city. Your orders will be filled promptly.

D. M. STEWARD MFG. CO., Established 1876,

CHATTANOOGA, TENN.

47 Murray Street, New York.
Fensterer & Ruhe, Agents.

THE AUTOMATIC HYDRAULIC MOTOR



will more than double the candle power of the ordinary mantle light. Get particulars. Leased to consumers through gas companies only. An interesting and liberal proposition will be submitted to gas companies for the asking.

HYDRAULIC MOTOR SERVICE COMPANY, 14 & 16 Park Place, New York.

THE AMERICAN STANDARD COMPOSITION CO.

—) MANUFACTURES (—

HEAT PROOF AND DAMP PROOF PAINTS

For Structural Iron and Steel, Gas Apparatus, Underground Piping, Boiler Fronts, Stacks, etc.

Our Paints will not crack, peel or scale. Heat does not affect them. They are moisture proof.

They are the Paints that Don't Come Off!

We let you Try before you Buy. Send for samples and prices.

AMERICAN STANDARD COMPOSITION COMPANY,

1707, Wall Street Exchange Building, New York.

HUMPHREY OVAL GAS HEATERS,

THE FINEST COMBINED GAS HEATERS AND GAS HOT PLATE IN THE WORLD. THOROUGHLY PRACTICAL.

Heat with the whole of it.

COMPLETE SECTIONAL VIEW.

Cook with the half of it.

OPERATION.

The coldest air lies next to the floor always. The Humphrey Oval (see illustration) takes the cold air from the floor, heats it hot and forces it out at the side. Other stoves allow this heat to rise directly to the ceiling without being diffused through the room, thus taking a long time to heat the room, wasting time and fuel.

Height, 16 inches. Weight, 4½ pounds.

Price, polished nickel, per dozen....$24

Not sold in less than dozen lots.

Liberal Discounts and Prompt Shipments. :: :: :: ::

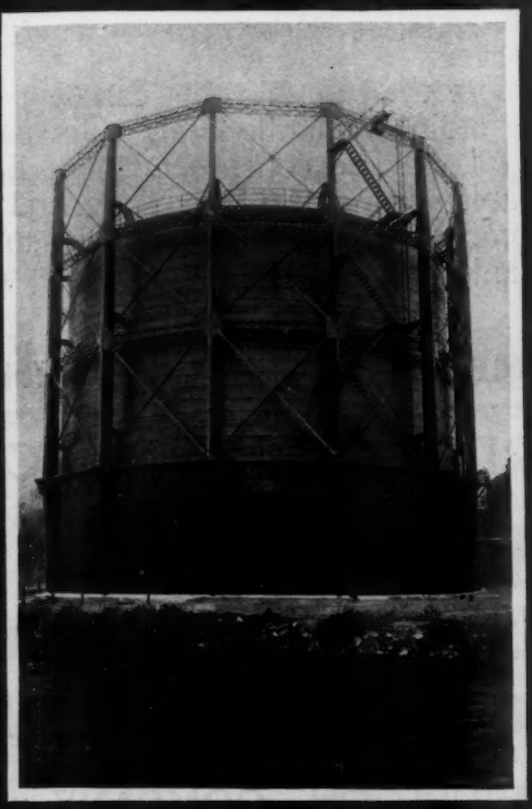
Why not send us an order to-day for your season's requirements?

For every hot water need, use a Humphrey Crescent Instantaneous or an Automatic Water Heater. :: ::

Divides in the middle. No nuts, bolts or screws.

When not in use, or to pack, pull the legs out, untwist the burner and pull it out, tuck one-half of the jacket inside the other and lay the legs and burner in the bowl. A child can do it, and, when done, it occupies a very small space.

HUMPHREY CO., Kalamazoo, Mich., U. S. A.



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CRUSE-KEMPER COMPANY

PHILADELPHIA OFFICES
1205-6 Stephen Girard Building

WORKS
Ambler, Pa

Manufacturers of

TRIPLE
DOUBLE and
SINGLE-LIFT

Gas Holders

WITH OR WITHOUT
METAL TANKS

Oil and Water Tanks
Purifier Covers
General Plate Metal Work and
Steel Water Towers

PLANS, SPECIFICATIONS AND ESTIMATES
PROMPTLY FURNISHED ON REQUEST

WHY DO GAS EXHAUSTERS

AND HIGH PRESSURE GAS PUMPS BUILT BY

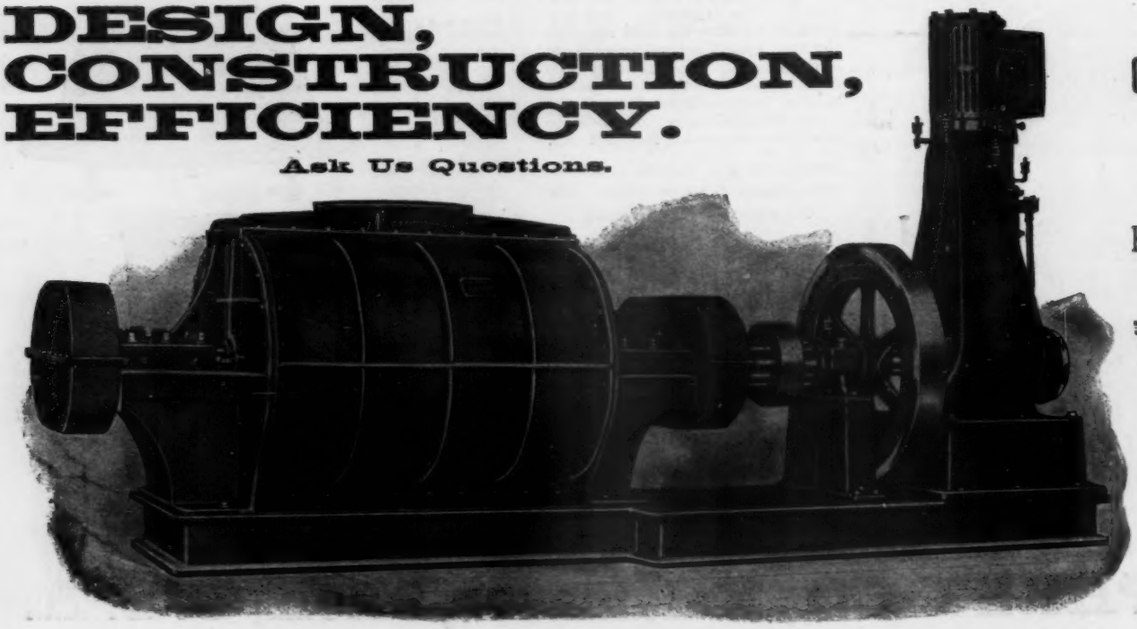
THE CONNERSVILLE BLOWER CO.

Stand so High in the estimation of those using them?

THE ANSWER IS IN THREE WORDS:

**DESIGN,
CONSTRUCTION,
EFFICIENCY.**

Ask Us Questions.



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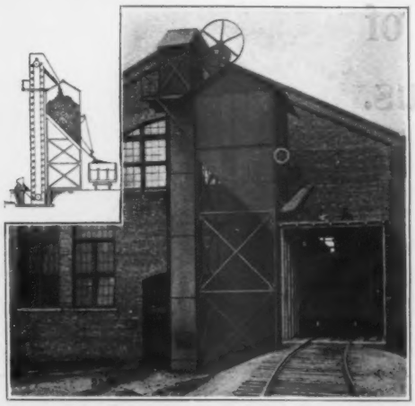

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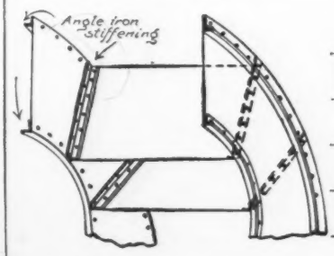

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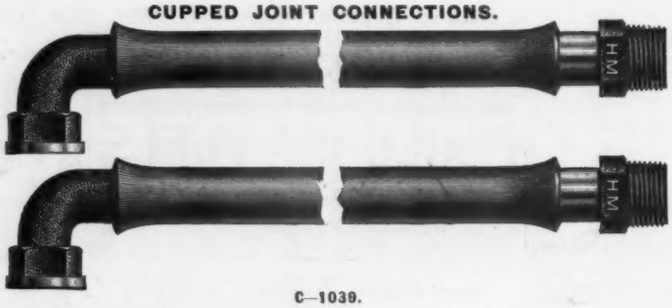

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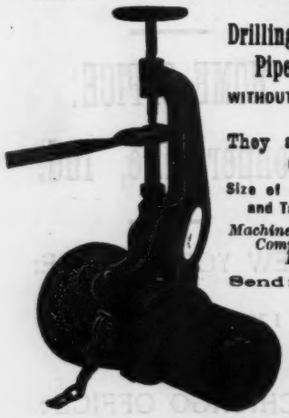

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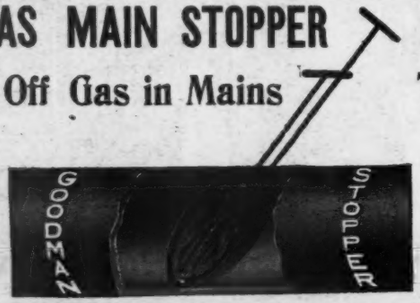

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PUBLIC LIGHTING TABLE.

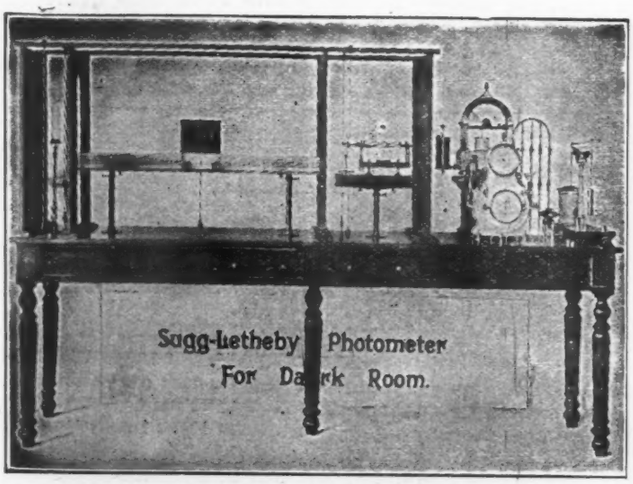
DECEMBER, 1905.

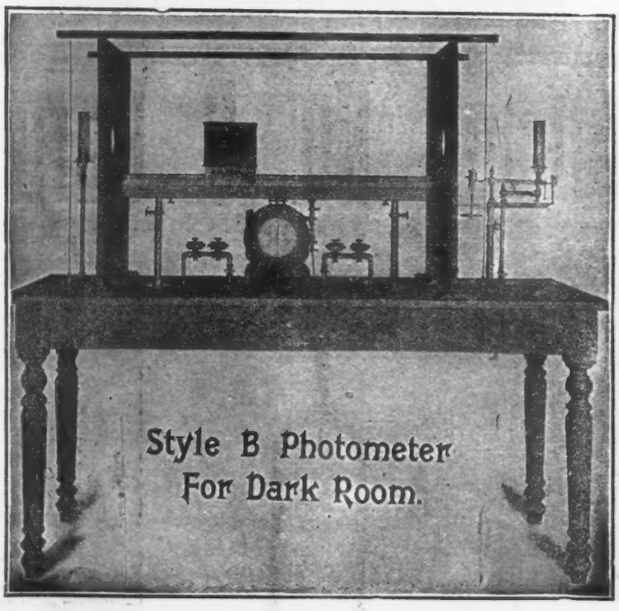
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Fri.	1	9.00 PM	6.00 AM
Sat.	2	10.00	6.00
Sun.	3	11.00 FQ	6.10
Mon.	4	12 00	6.10
Tue.	5	12.50 AM	6.10
Wed.	6	1.50	6.10
Thu.	7	2.40	6.10
Fri	8	3.40	6.10
Sat.	9	4.40	6.10
Sun	10	No L.	No L.
Mon.	11	No L. FM	No L.
Tue.	12	No L.	No L.
Wed.	13	5.00 PM	7.20 PM
Thu.	14	5.00	8.20
Fri.	15	5.00	9.20
Sat.	16	5.00	10.20
Sun.	17	5.10	11.20
Mon.	18	5.10	12.30 AM
Tue.	19	5.10 LQ	1.40
Wed.	20	5.10	2.50
Thu.	21	5.10	4.00
Fri.	22	5.10	6.20
Sat.	23	5.10	6.20
Sun.	24	5.10	6.20
Mon.	25	5.10 NM	6.20
Tue.	26	5.10	6.20
Wed.	27	5.10	6.20
Thu.	28	5.10	6.20
Fri.	29	5.10	6.20
Sat.	30	8.40	6.20
Sun.	31	9.40	6.20

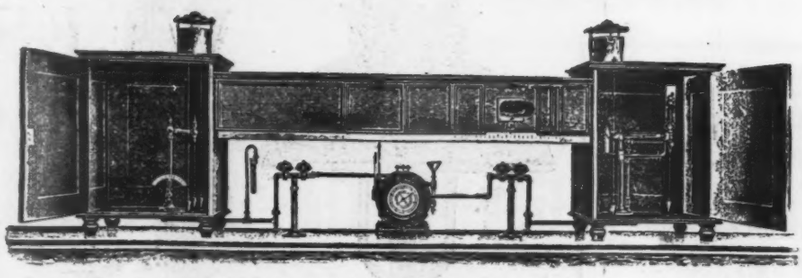
TOTAL HOURS DURING 1905.

By Table No. 1.

	Hrs.Min.
January	240.50
February	192.20
March	207.00
April	175.10
May	161.00
June	139.50
July	149.00
August	161.50
September	173.00
October	205.00
November	211.00
December	229.00
Total, yr.	2245.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

DECEMBER, 1905.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light.	Extinguish.
		P. M.	A.M.
Fri.	1	4.20	6.10
Sat.	2	4.20	6.10
Sun.	3	4.20	6.15
Mon.	4	4.20	6.15
Tue.	5	4.20	6.15
Wed.	6	4.20	6.15
Thu.	7	4.20	6.15
Fri.	8	4.20	6.15
Sat.	9	4.20	6.15
Sun.	10	4.20	6.20
Mon.	11	4.20	6.20
Tue.	12	4.20	6.20
Wed.	13	4.20	6.20
Thu.	14	4.20	6.20
Fri.	15	4.20	6.20
Sat.	16	4.20	6.20
Sun.	17	4.20	6.20
Mon.	18	4.20	6.20
Tue.	19	4.20	6.20
Wed.	20	4.20	6.20
Thu.	21	4.20	6.20
Fri.	22	4.20	6.20
Sat.	23	4.20	6.20
Sun.	24	4.20	6.25
Mon.	25	4.20	6.25
Tue.	26	4.20	6.25
Wed.	27	4.20	6.25
Thu.	28	4.20	6.25
Fri.	29	4.20	6.25
Sat.	30	4.20	6.25
Sun.	31	4.20	6.25

TOTAL HOURS DURING 1905.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

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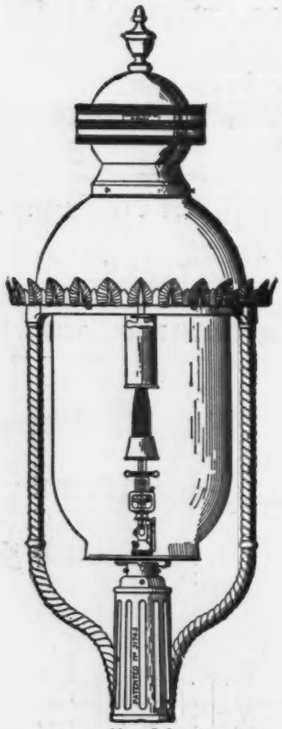
WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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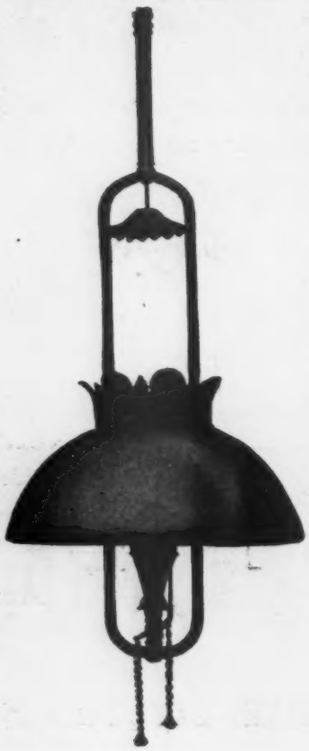

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TOTAL DAILY CAPACITY TO JULY 1ST, 1905, . 455,980,000 CU. FT.

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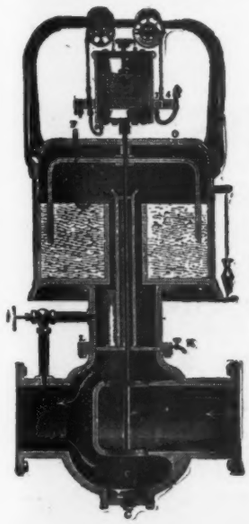

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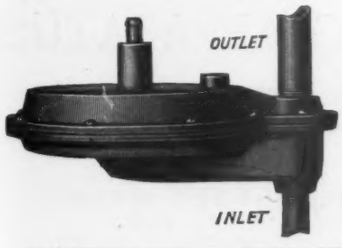

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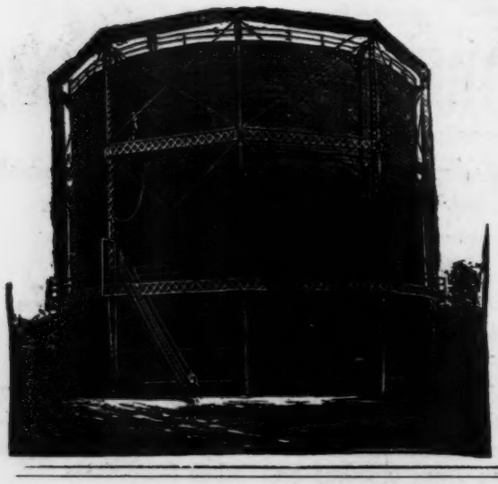

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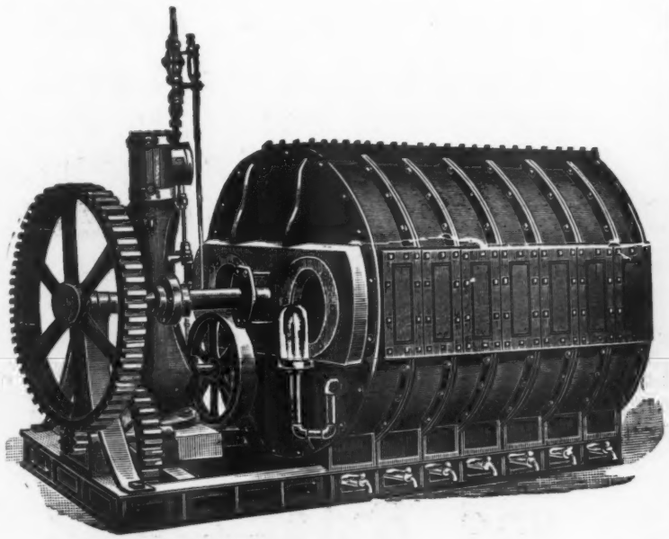

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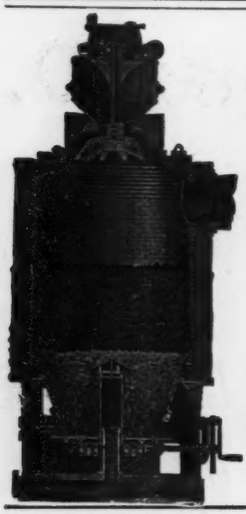

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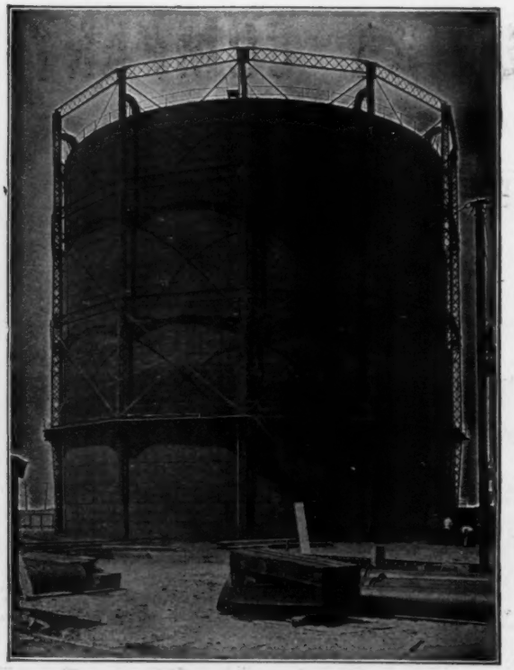

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